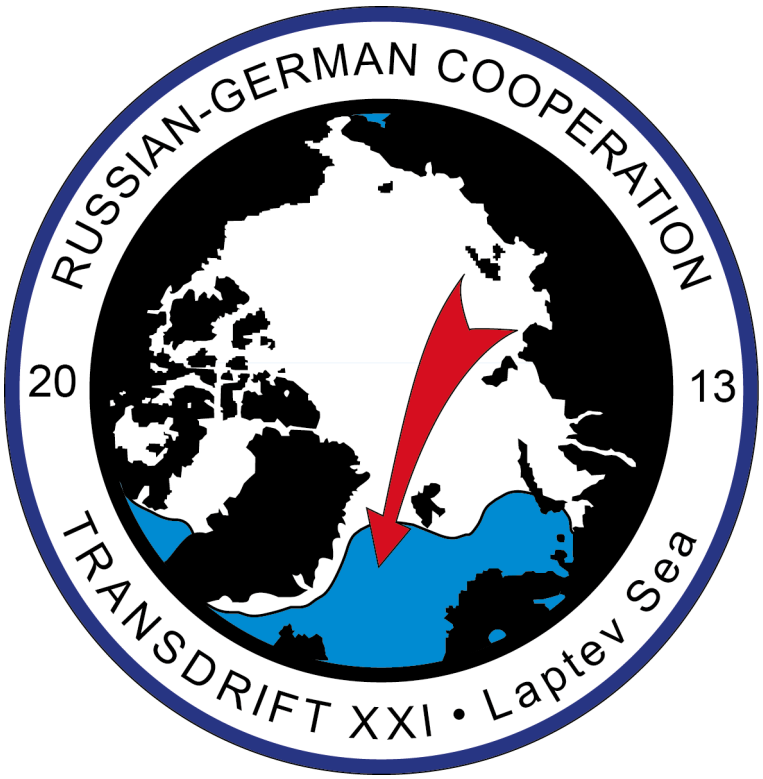
RUSSIAN-GERMAN COOPERATION

Laptev Sea System



TRANSDRIFT XXI Expedition, August 22 – September 21, 2013

Cruise Report

H. Kassens, K. Volkmann-Lark, and the shipboard scientific party

CONTENTS

INTRODUCTION AND OVERVIEW

The dimension and rate of climate change in the Arctic are a source of serious concern. The ice extent in the Arctic Ocean in summer has dramatically decreased and sea ice volume has even diminished by 75% in the past 30 years. The sea ice has become unstable and large areas of open water can be observed. These changes are particularly dramatic in the region of the Transpolar Drift Stream, which transports sea ice from Siberia's coasts across the North Pole into the Fram Strait between Spitsbergen and Greenland (Fig. 1). Multiyear ice increasingly diminishes and the mean drift velocity of the ice has doubled during the past years.

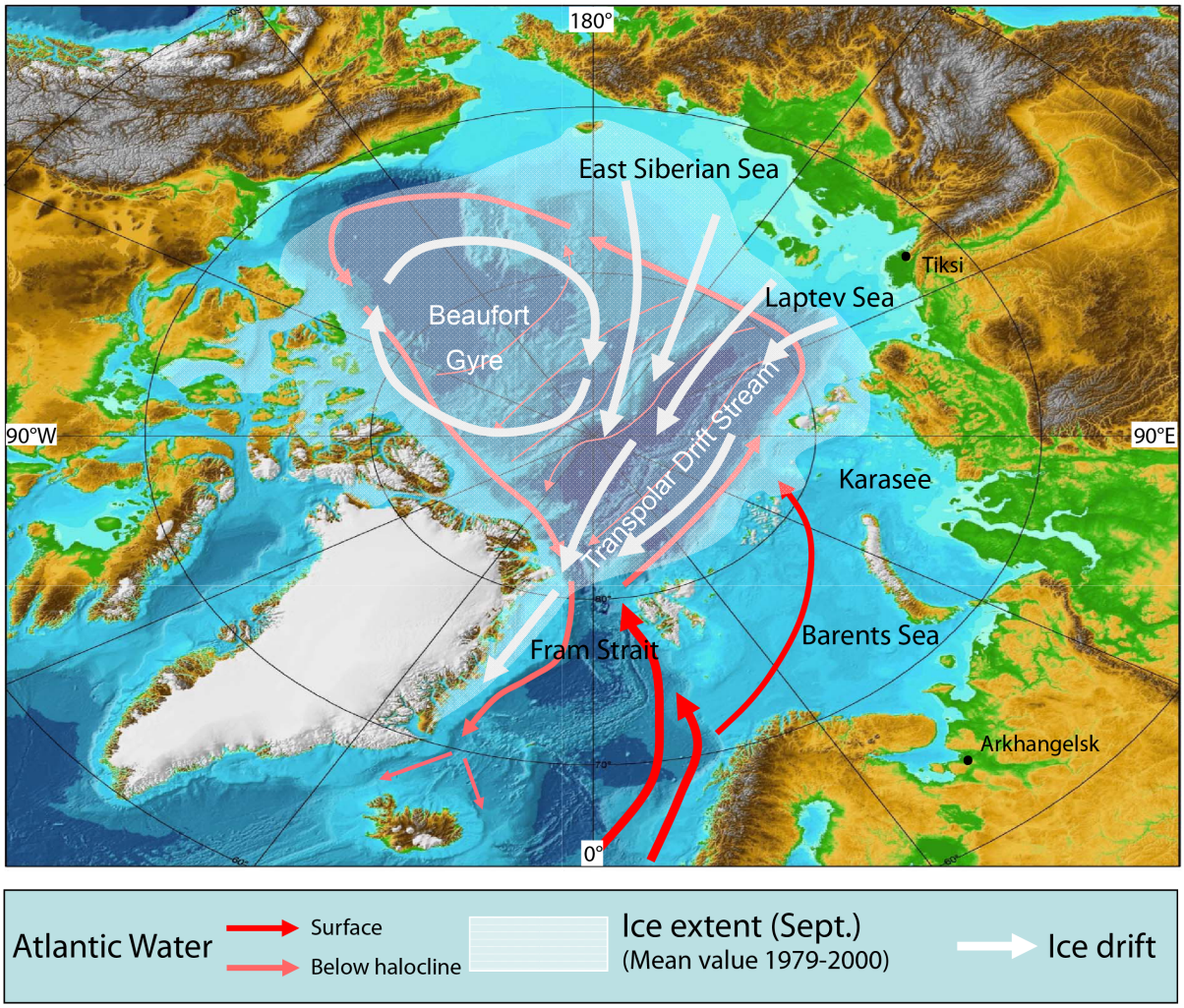


Fig. 1: Scheme of the ice drift and ocean circulation in the Arctic Ocean with the research areas of the joint project in the Laptev Sea and Fram Strait. Together with the Beaufort Gyre, the Transpolar Drift Stream is one of the two major ice drift system in the Arctic Ocean. Both systems are driven by atmospheric circulation.

Since 2006 a distinct change of the whole Arctic Ocean ecosystem has been observed. Sea-ice biota are losing their habitat. Increasing ice-free areas in summer result in a distinct increase in biological productivity (by up to 135% in the Siberian shelf seas). The water masses of the upper ocean layers have become warmer and less saline during the past few years. The mean temperature of the Atlantic water masses between 200 and 900 m water depth has distinctly increased in the Eurasian part of the Arctic Ocean. The invasion of Atlantic species into the Arctic Ocean, the so-called „Atlantification", and increasing ocean acidification will have an impact on the habitat of the highly specialized species which can so far not be assessed.

These climate changes do not only directly affect the ecosystem but are also of socio-economic consequences. If along the Northwest Passage und Northern Sea Route the ocean will be ice-free as already happened, for example, in the summers of 2010 and 2011 and if the sea ice further retreats or even melts completely during summer, this will open up new access to terrestrial and marine natural resources at the coasts of Siberia and North America. New navigation routes and fishing grounds will be accessible along the Northwest Passage und Northern Sea Route and even in the Arctic Ocean. All this will essentially change the living conditions of the local people.

The joint Russian-German research project "Laptev Sea System: The Transpolar System of the Arctic Ocean" (Transdrift) aims to assess how climate change will affect the highly sensitive Arctic environment and in how far the changes will be of consequence for Europe. The main objectives are to investigate:

- the changes in oceanic transfer of energy, matter and momentum in the Transpolar Drift system as a result of climate change;
- the ecological consequences of climate change in the region of the Transpolar Drift;
- regional changes of the atmosphere/sea ice/ocean system in the Arctic;
- the stability of the arctic climate system: history of the Transpolar Drift.

Research areas are the Laptev Sea as the most important area of sea-ice production and the Fram Strait as the only deepwater and intermediate water connection between the Arctic Ocean and the Atlantic Ocean. The Transpolar Drift Stream connects both regions. At the same time, the Russian partner institution, the State Scientific Center of the Russian Federation the Arctic and Antarctic Research Institute (AARI), St. Petersburg, implements complex investigations in the Central Arctic Ocean as the key research topic of their research program „Arctic Basin Cluster“.

The joint Russian-German project "Laptev Sea System: Transdrift" is funded by the German Federal Ministry for Education and Research, the Russian Ministry of Education and Science, AARI, Alfred Wegener Institute Helmholtz Center for Polar and Marine Research (AWI), GEOMAR Helmholtz Center for Ocean Research, Kiel University, Mainz Academy of Sciences, Humanities and Literature, and Trier University.

The TRANSDRIFT XXI expedition to the Laptev Sea is an integral part of the project "Laptev Sea System: Transdrift". The goal of the expedition was to recover three seafloor observtories (OSL4, KHATANGA11, ANABAR10) and to deploy four seafloor observtories (TAYMYR, VILKITSKY, 1893, KOTELNYY). Of particular interest was the use of upward-looking sonars (ULS) and a Remote Access Sampler. In addition, we planned to carry out oceanographic, biological, hydrochemical and sedimentological investigations along N-S and W-E transects.

The vessel used for the expedition was the RV VIKTOR BUYNITSKIY (N.N. Zubov State Institute of Oceanography, Moscow, Russia; Figs. 2, 3). The technical data of the ship are the following: IMO: 8422448, callsign: UAJX, MMSI: 273453300, type: research vessel, gross tonnage: 693 t, net tonnage: 207 t, dreadweight: 293 t, draught: 3.6 m , size: 50 * 10 m, built: 1986, Finnland, flag: Russia, home port: Murmansk.

The research team of the expedition comprised 19 scientists from the Alfred Wegener Institute of Polar and Marine Research, Arctic and Antarctic Research Institute, GEOMAR Helmholtz Centre for Ocean Sciences Kiel, Kiel University, Lena Delta Nature Reserve, Mainz Academy of Sciences, Humanities and Literature, Moscow State University, and P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences (Fig. 4).

Fig. 2: RV VIKTOR BUYNITSKIY.

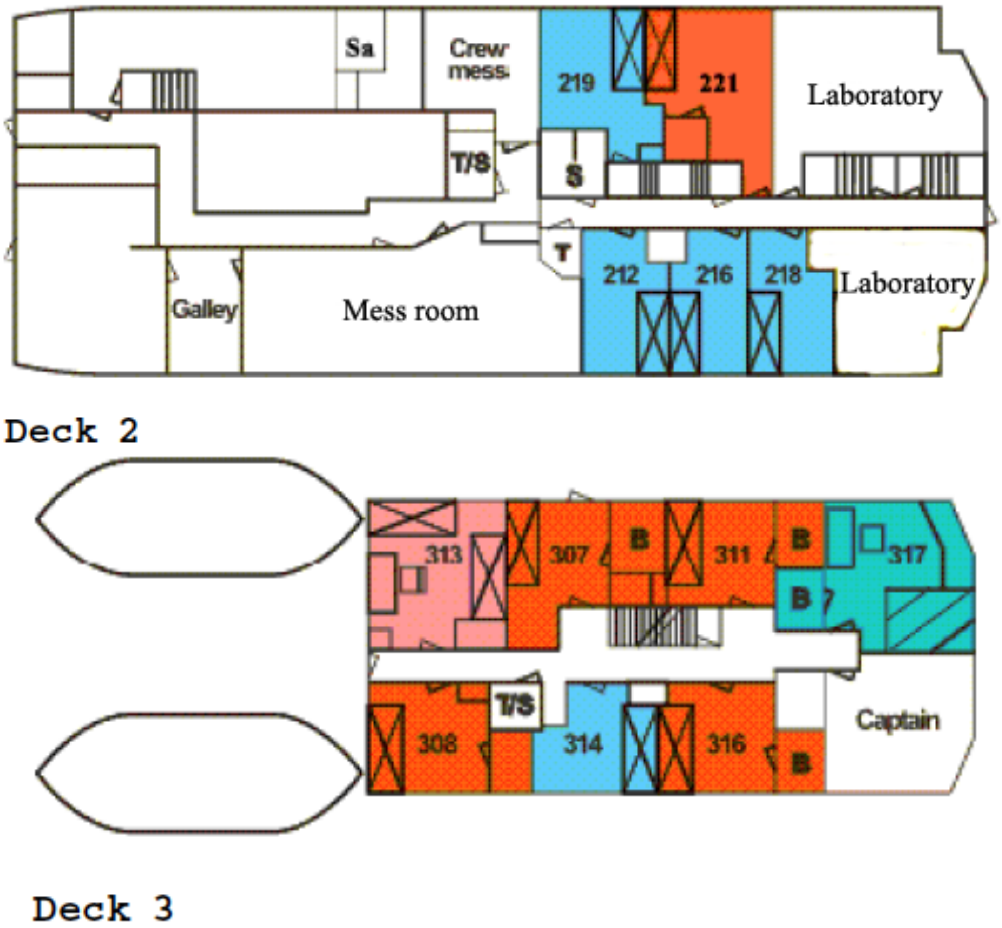


Fig. 3: Deck plan of RV VIKTOR BUYNITSKIY.

Fig. 4: The participants of the TRANSDRIFT XXI expedition. Standing (from left to right): Elena Dobrotina, Heidi Kassens, Dmitry Selitrenikov, Ekaterina Chernyavskaya, Felix Müller, Irina Kryukova, Benoît Thibodeau, Sergei Korsun, Fedor Martynov, Tim Sandmann, Bennet Juhls, Ekaterina Abramova, Markus Janout, Ivan Vorobyev (Lena Delta State Reserve; did not participate), Matthias Monsees; squatting (from left to right): Georgi Laukert, Alexandr Ipatov, Jens Hölemann, Dieter Piepenburg, Yaroslav Ovsepyan, Konstantin (driver of the Lena Delta Nature Reserve).

RV VIKTOR BUYNITSKIY departed from the port of Arkhangelsk, where the scientists joined the expedition and all scientific equipment was loaded, on August 25 (Fig. 5). From there we sailed along the Northern Sea Route to the Laptev Sea. Due to winch problems during a test run on August 26 and harsh ice conditions in the Vilkitsky Strait, we arrived two days later than anticipated in the working area in the western Laptev Sea, on September 5.

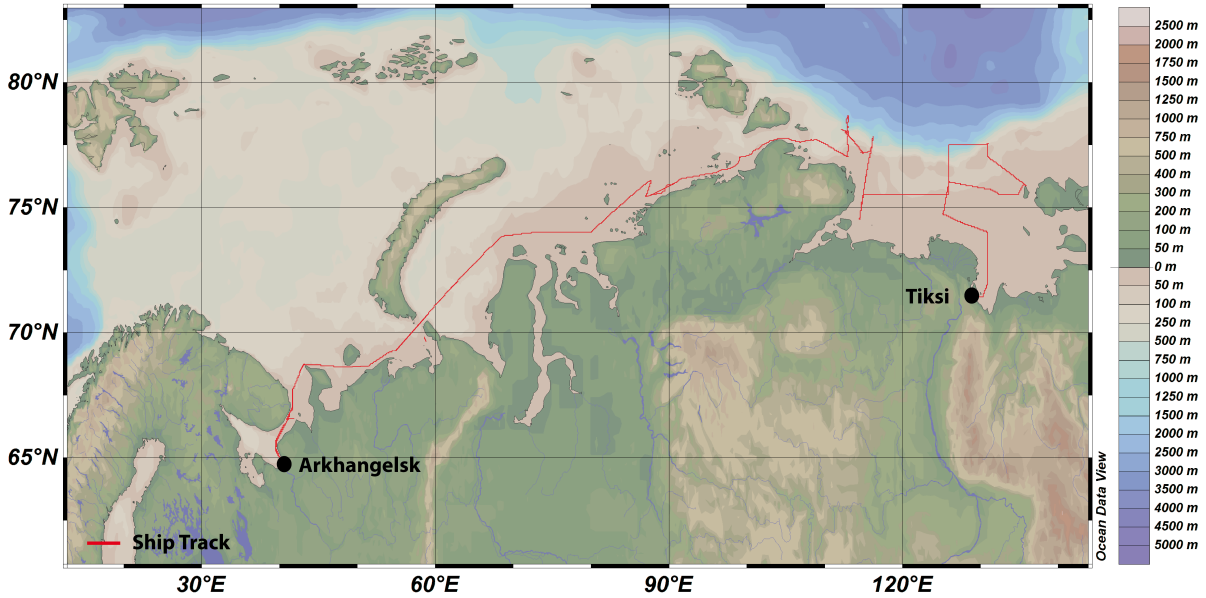


Fig. 5: Cruise track of the TRANSDRIFT XXI expedition.

While waiting for icebreaker support, we carried out a test station close to the ice edge in the

Vilkitsky Strait on September 1 (only U-CTD) and September 2.

On September 3, we sailed with the support of I/B YAMAL and I/B 50 LET POBEDY through the Vilkitsky Strait (Fig. 6). Finally, at 12:20 h on September 5, we reached the ice edge in the northwestern Laptev Sea, up to where the convoy, led by I/B 50 LET POBEDY, accompanied us.

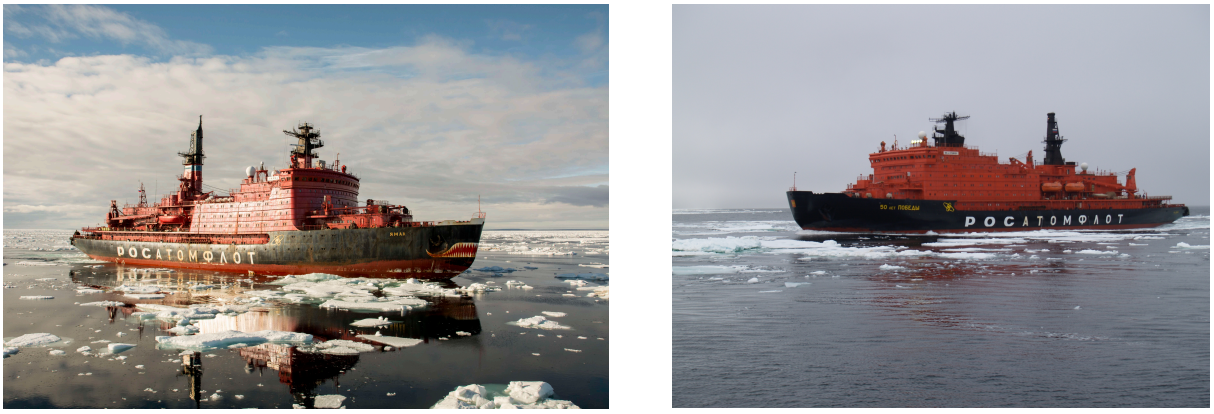


Fig. 6: The icebreakters YAMAL (left) and 50 LET POBEDY (right) accompany the convoy through the Vilkitsky Strait.

We started the working program on September 5 at 19:00 at station VB13 01 (Fig. 7; see Appendix B: Station list) and along the N/S-transect 113°. Here we deployed the seafloor observatories VILKITSKY in 326 m water depth on September 7 and TAYMYR I / II in 59 m water depth on September 9. All attempts to recover the seafloor observatory OSL4 failed. After this transect we continued along the Kathanga Valley and along the W/E transect 75°30 until September 11. During this night the weather became stormy, putting an end to our work at the station at the position of seafloor observatory 1893. On September 12 and 13, we were forced to discontinue all station work and seek shelter NE of Belkovsky Island.

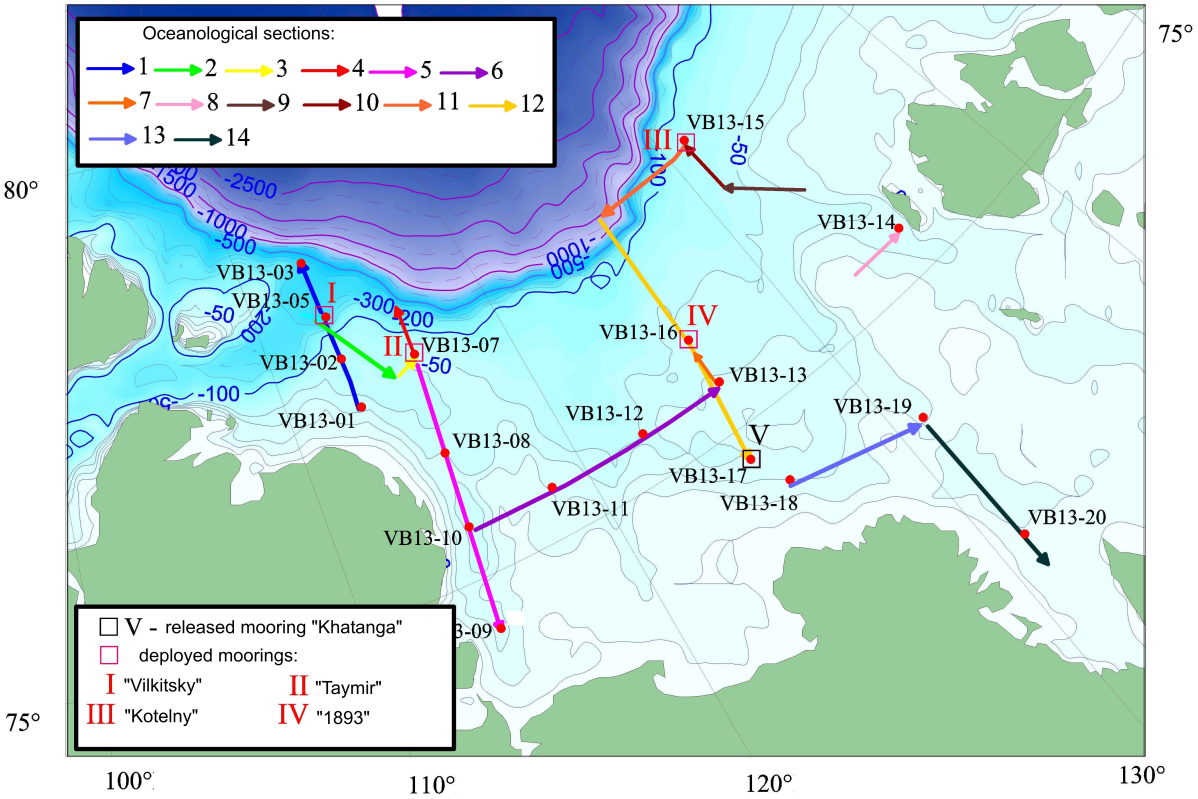


Fig. 7: Map of the working area with the transects and the positions of the stations and seafloor observatories.

On September 14, we deployed the seafloor observatory KOTELNYY in the northeastern Laptev Sea at 68 m water depth. After 12 hours of station work, we carried out a U-CTD profile along the continental slope and along the S-transect 126°. On September 15, we deployed the seafloor observatory 1893 I/II/III at 45 m water depth on this transect.

The last three days of our expedition were spent north of the Lena Delta. Here we successfully recovered the seafloor observatory KHATANGA11, which had been deployed in 2011. Unfortunately, we failed to recover ANABAR10 in the region of the Laptev Sea polynya. At station VB13 20, we completed our scientific program east of the Lena Delta on September 17.

At 4:00 h on September 18, we arrived to the port of Tiksi.

During the following two days, we packed a lot of boxes, including several hundreds of water and sediment samples, and cleaned all labs and cabins. On September 20, twenty-one happy scientists returned back home by plane with a delay of one day because the plane was behind flight schedule.

TRANSDRIFT XXI was a successful expedition. During 27 days and 3,468 nm onboard RV VIKTOR BUYNITSKIY the crew and the shipboard scientific party worked at 20 stations along four N-S and four E-W transects. All four seafloor observations were deployed and one seafloor observatory could be recovered north of the Lena Delta.

A novelty was the use of an Underway CTD. This allowed us to profile temperature and salinity of the water column even in rougher seas and while the ship was en route. The underway sampling complemented the station work to provide a more comprehensive and high-resolution picture of the region's water masses.

Also for the first time, we attached a Remote Access Sampler (RAS-100) to a seafloor observatory (1893). The RAS-100 is programmed to take a water sample (100 ml) once a week for 48 weeks. These samples will be used to investigate the dynamics of the water masses throughout the year at this single location, which is located under pack ice.

One of the most important results of the expedition was that the surface water temperature in the Laptev Sea in summer 2013 was everywhere higher than the mean long-term values. The highest anomalies were observed in the central part of the sea, where positive anomalies reached 3°C. Such high temperatures were the result of the influence of input of atmopsheric heat, which was anomalously strong in July and slightly less in August.

The expedition TRANSDRIFT XXI would not have been possible without the support of numerous colleagues in Germany and Russia. Many thanks go to AARI, AWI, GEOMAR, the Institute of Water Problems of the Russian Academy of Sciences (RAS), Lena Delta Nature Reserve, Mainz Academy of Sciences, Humanities and Literature, Moscow State University, and P.P. Shirshov Institute of Oceanology RAS for their excellent cooperation. Also we would like to thank Captain Alexander Streshov and his crew for their excellent support.

The expedition was funded by the German Federal Ministry for Education and Research (project no. 03G0833), Russian Ministry of Education and Science, Roshydromet, Russian Foundation for Basic Research, AARI, AWI, GEOMAR, and Kiel University. We would like to thank these organisations for their financial and logistic support.

WEATHER AND ICE CONDITIONS

A. Ipatov
Arctic and Antarctic Research Institute, St. Petersburg, Russia

During the cruise, the meteorological observations were provided by the ship's navigation officers. Temperature, and wind speed and direction were measured with the ship's weather station and atmospheric pressure data with a barometer-aneroid. Information on cloudiness were obtained visually.

The meteorological data recordings are available for August 28 to September 17, 2013: daily 12:00 (Moscow time, MSC), during all-day observations 00:00 MSC additionally and after oceanographic stations started. The recordings' start time always relates to MSC. Wind direction at 12:00 and 00:00 MSC was recorded with an accuracy of half a compass point and without cloudiness observations. Daily atmospheric pressure data from synoptic maps at 0 mb level, 00:00 UTC (source - AARI site (www.aari.ru)) were used to complete the analyzed meteorological recordings of the cruise.

Information on ice conditions was received from AARI as ice-condition maps for August 18-20, August 25-27, September 1-3, September 8-10 (Arctic Ocean), and August 18-20, August 22-23, August 25-27, August 29-30, September 1-3 (Kara and Laptev seas).

Meteorological observations data

The time series of meteorological parameters mentioned above are shown in Figure 8. Averaging for the whole period of observations, we obtain the following meteorological parameters: atmospheric pressure of 1009.67 mb, air temperature of +1.21°C, wind speed of 5.34 m/s and wind direction of 124.2°; wind speed of 7.87 m/s (mean module). Taking into account the probability diagram of wind speed and direction (Fig. 9), eastern wind directions predominated (45-135°) generally, and within this range, wind directions of 135-112.5° were recorded often with a wind speed of 8-10 m/s. Strong wind (>10 m/s) was also observed more often from directions between 45-135°.

The time series of the wind speed (Fig. 8) is characterized by increased variability after September 12 due to changes in the baric situation over the ship's position. Extreme wind speed were 14 m/s (September 12) and 4 m/s (September 11, 16). Southeastern wind prevails over other directions as was mentioned before. This is also presented in Figure 8. Southern and southwestern wind was recorded from August 31 to September 3 and from September 9 to 11, eastern and northeastern winds directions were recorded from September 5 to 7 and on September 17. Northern wind directions were never recorded.

Changes of air temperature were not significant – rather within the range of -1÷+3°C, except for August 29 when the maximum temperature of +9°C was recorded while the ship was positioned at the southwestern part of the cruise's trajectory. The lowest temperature was recorded on September 06 (-1.4°C) as is presented in Figure 8. The atmospheric pressure was characterized by a local maximum on September 06 (1017.7 mb) and by a consistently high pressure after September 14 (absolute maximum of 1028.84 mb on September 16). The lowest atmospheric pressure was recorded on September 10 (992.84 mb). Temperature and pressure curves are in reverse relationship, i. e. air temperature conditions are caused by the movement of cyclones and anticyclones over the point of observation.

The meteorological data records are presented in Table 1.

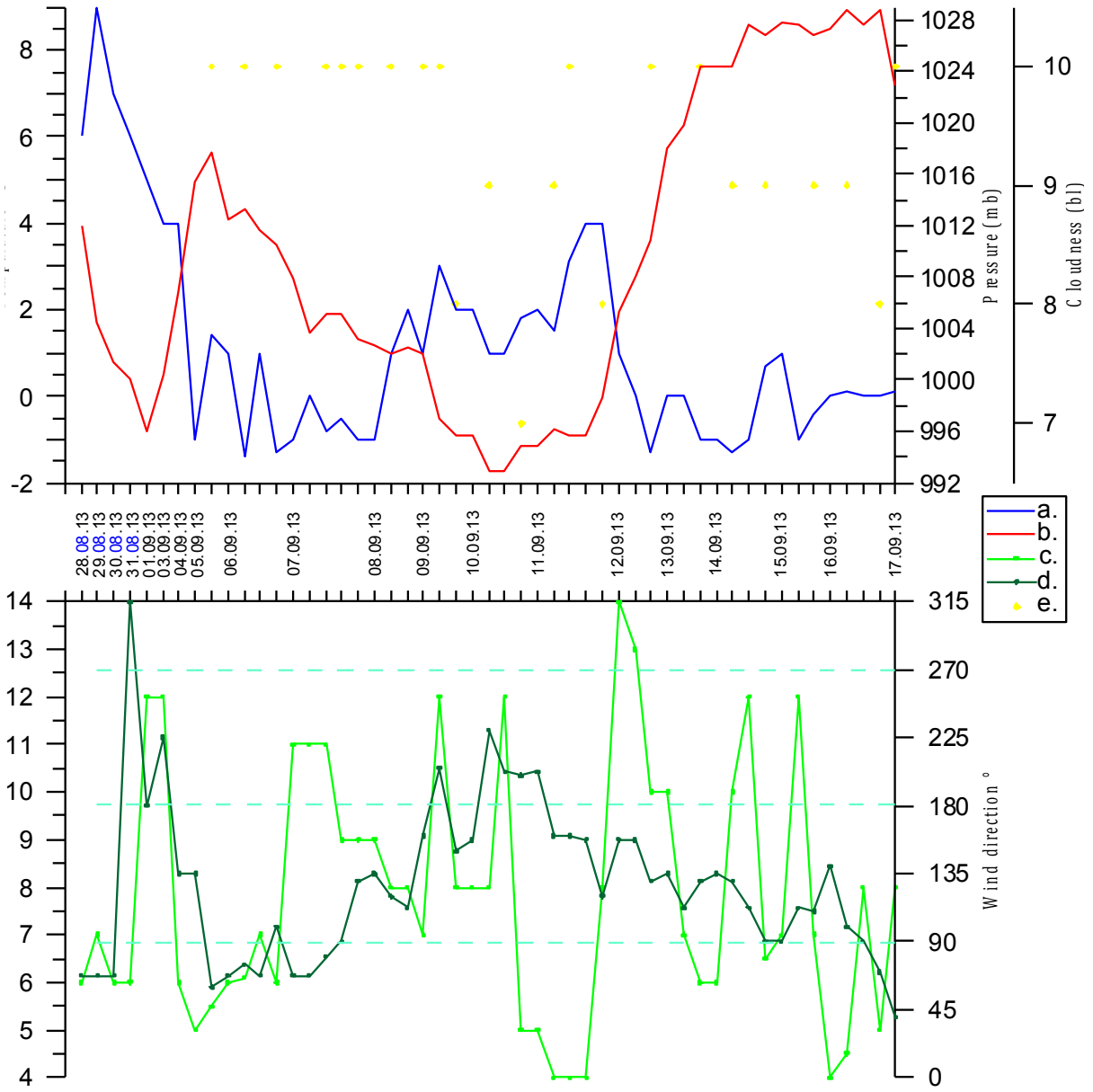


Fig. 8: Time series of air temperature (a), atmospheric pressure (b), wind speed (c) and direction (d), and cloudiness (e).

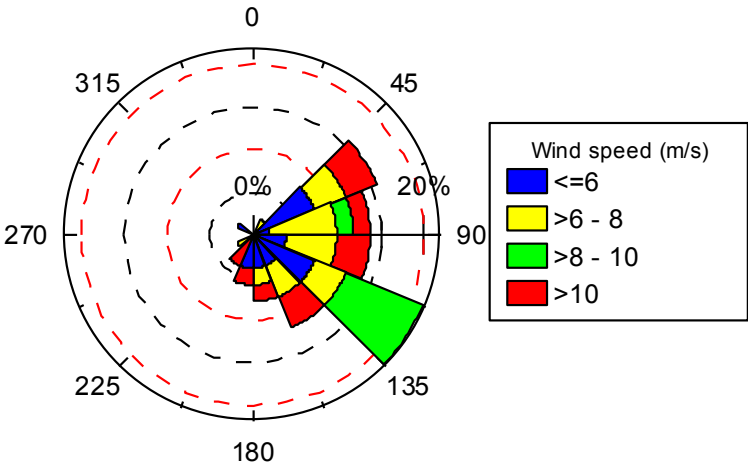


Fig. 9: Probability diagram of wind speed and directions (by half-compass points).

Table 1: Meteorological data (continued on next page)

Date	Time [MSC]	Station no.	Wind		Air temperature [°C]	Atmospheric pressure [mb]	Clouds	
			Direction [°]	Speed [m/s]			Quantity	Form
28.08.2013	12:00	-	67.5	6.0	+10.0	1012.00	-	-
29.08.2013	12:00	-	67.5	7.0	+9.0	1004.55	-	-
30.08.2013	12:00	-	67.5	6.0	+7.0	1001.36	-	-
31.08.2013	12:00	-	315.0	6.0	+6.0	1000.03	-	-
01.09.2013	12:00	-	180.0	12.0	+5.0	996.04	-	-
03.09.2013	12:00	-	225.0	12.0	+4.0	1000.43	-	-
04.09.2013	12:00	-	135.0	6.0	+4.0	1006.68	-	-
05.09.2013	12:00	-	135.0	5.0	-1.0	1015.46	-	-
05.09.2013	19:07	VB13-01	60.0	5.5	+1.4	1017.70	10	Sc, St
06.09.2013	00:00	-	67.5	6.0	+1.0	1012.40	-	-
06.09.2013	02:35	VB13-02	75.0	6.1	-1.4	1013.30	10	St
06.09.2013	12:00	-	67.5	7.0	+1.0	1011.60	-	-
06.09.2013	13:51	VB13-03	100.0	6.0	-1.3	1010.53	10	St
07.09.2013	00:00	-	67.5	11.0	-1.0	1007.87	-	-
07.09.2013	12:00	-	67.5	11.0	0.0	1003.62	-	-
07.09.2013	13:20	VB13-04	80.0	11.0	-0.8	1005.08	10	St
07.09.2013	17:00	VB13-05	90.0	9.0	-0.5	1005.08	10	St
07.09.2013	21:06	VB13-05	130.0	9.0	-1.0	1003.22	10	St
08.09.2013	00:00	-	135.0	9.0	-1.0	1002.69	-	-
08.09.2013	07:30	VB13-06	120.0	8.0	+1.0	1002.00	10	St
08.09.2013	12:00	-	112.5	8.0	+2.0	1002.55	-	-
09.09.2013	00:59	VB13-07	160.0	7.0	+1.0	1002.00	10	Sc, St
09.09.2013	11:54	VB13-07	205.0	12.0	+3.0	996.97	10	Sc
09.09.2013	20:10	VB13-08	150.0	8.0	+2.0	995.64	8	Cu, Ns, Cu fr
10.09.2013	00:00	-	157.5	8.0	+2.0	995.64	-	-
10.09.2013	00:59	VB13-09	230.0	8.0	+1.0	992.84	9	Sc
10.09.2013	12:00	-	202.5	12.0	+1.0	992.84	-	-
10.09.2013	19:27	VB13-10	200.0	5.0	+1.8	994.84	7	As, Sc, Cu, Cu fr, Ns
11.09.2013	00:00	-	202.5	5.0	+2.0	994.84	-	-
11.09.2013	03:07	VB13-11	180.0	4.0	+1.5	996.17	10	St
11.09.2013	10:15	VB13-12	160.0	4.0	+3.1	995.64	10	St
11.09.2013	12:00	-	157.5	4.0	+4.0	995.64	-	-
11.09.2013	19:06	VB13-13	120.0	8.0	+4.0	998.56	8	Sc, St
12.09.2013	08:15	-	157.5	14.0	+1.0	1005.35	-	-
12.09.2013	12:00	-	157.5	13.0	0.0	1008.14	-	-
12.09.2013	20:55	VB13-14	130.0	10.0	-1.3	1010.80	10	St
13.09.2013	08:30	-	135.0	10.0	0.0	1017.98	-	-
13.09.2013	12:00	-	112.5	7.0	0.0	1019.84	-	-

Table 1 (continued): Meteorological data

Date	Time [MSC]	Station no.	Wind		Air temperature [°C]	Atmospheric pressure [mb]	Clouds	
			Direction [°]	Speed [m/s]			Quantity	Form
13.09.2013	20:55	VB13-15	130.0	6.0	-1.0	1024.37	10	Sc
14.09.2013	00:00	-	135.0	6.0	-1.0	1024.37	-	-
14.09.2013	01:30	VB13-15	130.0	10.0	-1.3	1024.37	9	Sc, Cu fr
14.09.2013	12:00	-	112.5	12.0	-1.0	1027.56	-	-
14.09.2013	20:55	VB13-16	90.0	6.5	+0.7	1026.8	9	Sc, St, Cu, Ns
15.09.2013	00:00	-	90.0	7.0	+1.0	1027.82	-	-
15.09.2013	12:00	-	112.5	12.0	-1.0	1027.56	-	-
15.09.2013	20:02	VB13-17	110.0	7.0	-0.4	1026.89	9	Sc, Ns
16.09.2013	00:00	-	135.0	4.0	0.0	1027.29	-	-
16.09.2013	06:20	VB13-18	100.0	4.5	+0.1	1028.84	9	Sc, Cu, Ns
16.09.2013	12:00	-	90.0	8.0	0.0	1027.56	-	-
16.09.2013	16:50	VB13-19	70.0	5.0	0.0	1028.81	8	Sc, Ns
17.09.2013	05:07	VB13-20	40.0	8.0	+0.1	1022.90	10	Sc, Ns, Cu fr

Weather conditions and baric fields

It is possible to summarize temporal changes of meteorological parameters by using maps of baric topography (atmospheric pressure at 0 mb, daily, 00:00 UTC) and recording data in the following way. On the whole, the differences of the weather conditions, shown in Figure 1, are caused by shifting baric depressions over northeast Kara Sea and the whole of the Laptev Sea before September 12 and baric ridges over the Laptev Sea after that date. As for details, it is possible to determine a few more short but distinctive time intervals:

- August 28-September 1 and September 9-12: the weather over the regions described here was caused by a shifting baric depression and a low atmospheric pressure field;
- September 5-09: the weather was caused by interaction between the baric depression and a field of high pressure;
- September 12-17: the weather was caused by a baric ridge covering the whole Laptev Sea.

From August 28-September 1, the weather conditions were formed by a cyclonic dipole system that moved over the Kara and Barents seas. The first center of this dipole system shifted from Taymyr Peninsula to the Severnaya Zemlya archipelago and the second one from the region between Spitsbergen and Franz Josef Land toward the Novaya Zemlya archipelago (10. 3A). This dipole system was inside an upper trough of the Iceland baric minimum and was blocked by the seasonal Siberian pressure maximum. After September 1, the cyclonic dipole system was transformed into a baric depression over the Kara Sea, situated closely to Severnaya Zemlya, then it shifted toward the Lena Delta on September 4. Our ship was at the eastern and southern periphery of the cyclone from August 29-September 2. The cyclone's deepening on September 1-2 (Fig. 10B) caused the intensification of the winds and the fall of the atmospheric pressure which we had recorded (Fig. 8).

Unlike the previous time interval, the low pressure field over the Laptev Sea during September 9-12 was formed by the cyclonic dipole system (Fig. 10C), with two centers: one to the south (and to the southeast) of Kotel'nyi Island and the other over Severnaya Zemlya. The cyclonic system, generated from a single cyclone, moved away from the Lena Delta. The

lowest atmospheric pressure was recorded on September 10 while the cyclone over Severnaya Zemlya deepened (Fig. 10C). As the ship was at the eastern cyclone periphery, southern winds and rising temperatures were recorded.

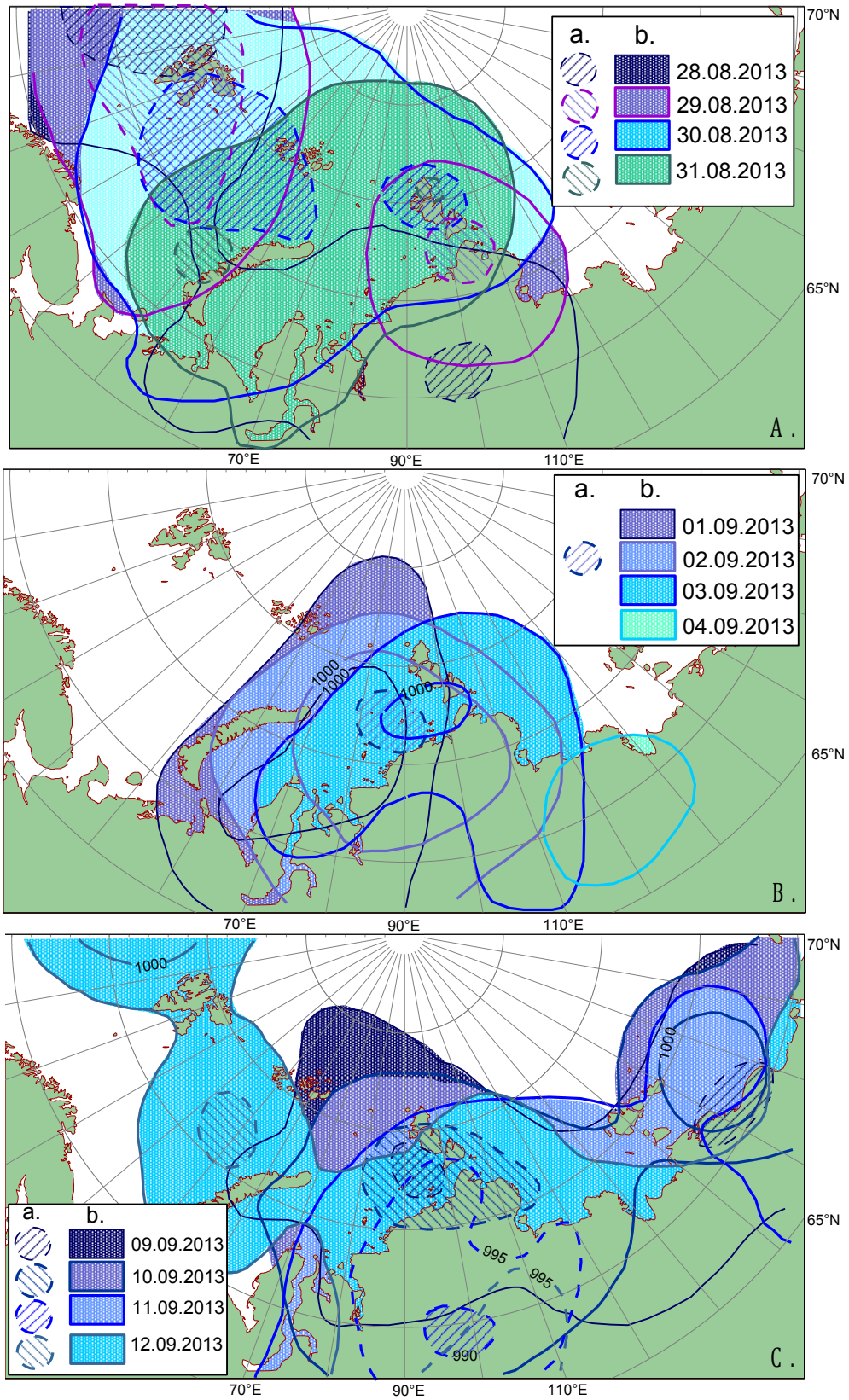


Fig. 10: Typical location of baric fields from August 28-31 (A) and September 9-12 (C) (both belonging to the cyclonic dipole system), and from September 1-4 (B) (single cyclone). The 1,005-mb isobath indicates a field border (b), the area marked by dashed lines (a) has a pressure lower than 995 mb, if not otherwise marked.

The weather conditions from September 5-9 (Fig. 11A) were influenced by baric depressions moving in latitudinal direction and the high atmospheric pressure field over the northern and northeastern part of the Laptev Sea. The high pressure field was a northern extension of a baric ridge situated over the European part of Russia. The high pressure field, mentioned above, divided the low pressure centers as shown in Figure 11A. The increase in atmospheric pressures and the subsiding winds on September 5 were recorded while the ship was situated inside a weakly increasing pressure field over the Laptev Sea with small pressure gradients. The last part of the period from September 7-9 (Fig. 11B) is characterized by an upper trough with a meridional axis as a part of a multicentered baric depression over Greenland. The baric ridge from the European part of Russia and a high pressure field over the Beaufort Sea were divided by the baric upper trough referred to above. The atmospheric pressure fell when a of the cyclone over Khatanga river mouth shift to the north and the wind intensified on September 7 as the pressure gradient became higher due to the interaction of the cyclones with a high-pressure field over Kotel'nyi Island.

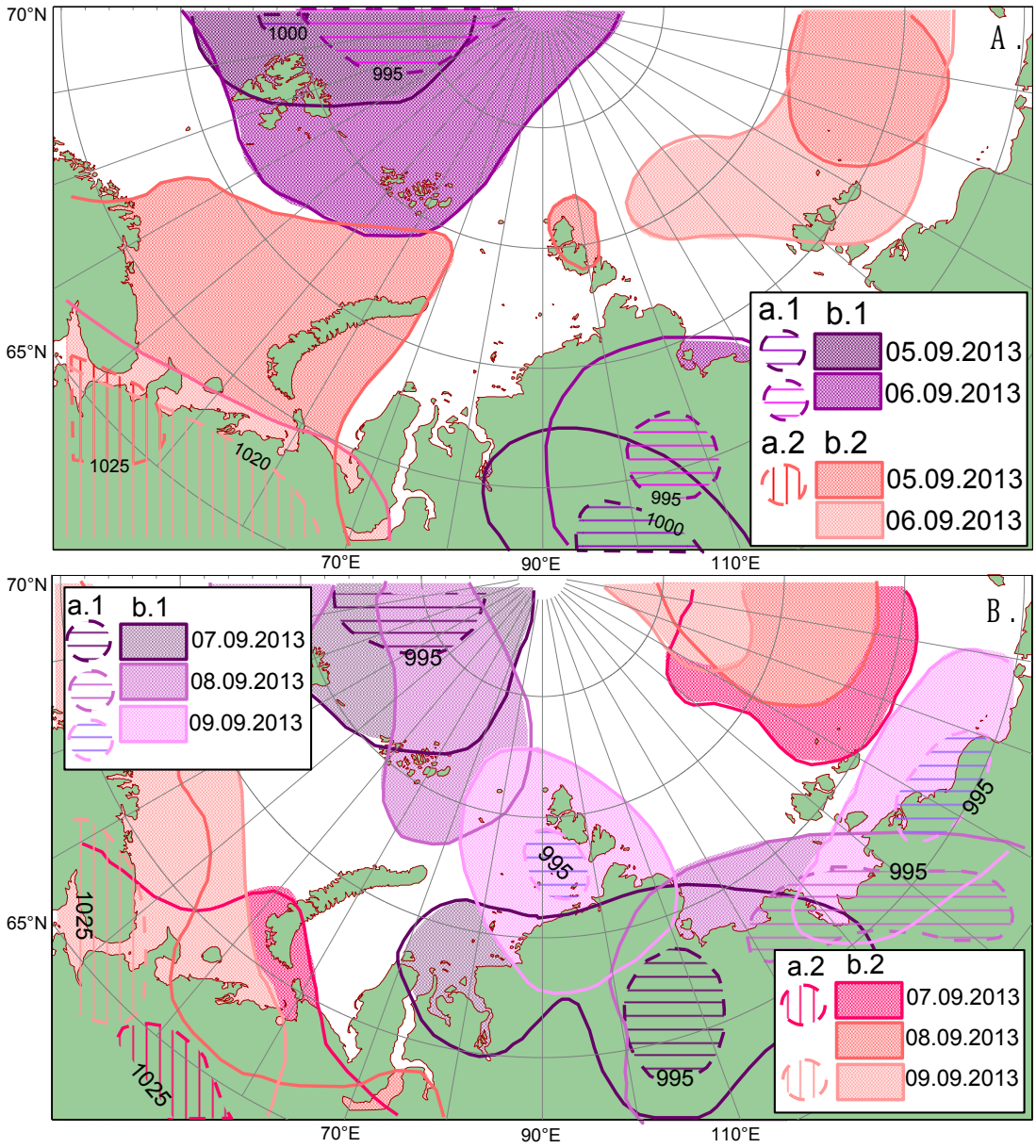


Fig. 11: Typical location of baric fields from September 5-6 (A) and 7-9 (B) (depressions with anticyclones). The 1,005-mb (September 5-6) and 1,000-mb (September 7-9) isobath indicates a low pressure field border (b.1). areas with lowest pressure are marked by a dashed line (a.1). The 1,015-mb isobath indicates a high pressure field border (b.2). The area with highest pressure (a.2) is marked by a dashed line.

The extensive field of low atmospheric pressure (Fig. 12) was removed to the south (it was situated over the Lena River area) by the baric ridge over Kotel'nyi Island on September 12. As a consequence, a zone of high baric gradients over the Laptev Sea, directed from north-west to southeast, was formed and wind speed intensification was recorded. Then, after September 12, the weather conditions over the Laptev Sea were determined by a baric ridge over Kotel'nyi Island. This high-pressure field changed in size and it expanded as a baric ridge with an axis in northwest-southeast direction on September 12-14 (Fig. 12A) and with an axis in northeast-southwest direction on September 14-17 (Fig. 12B).

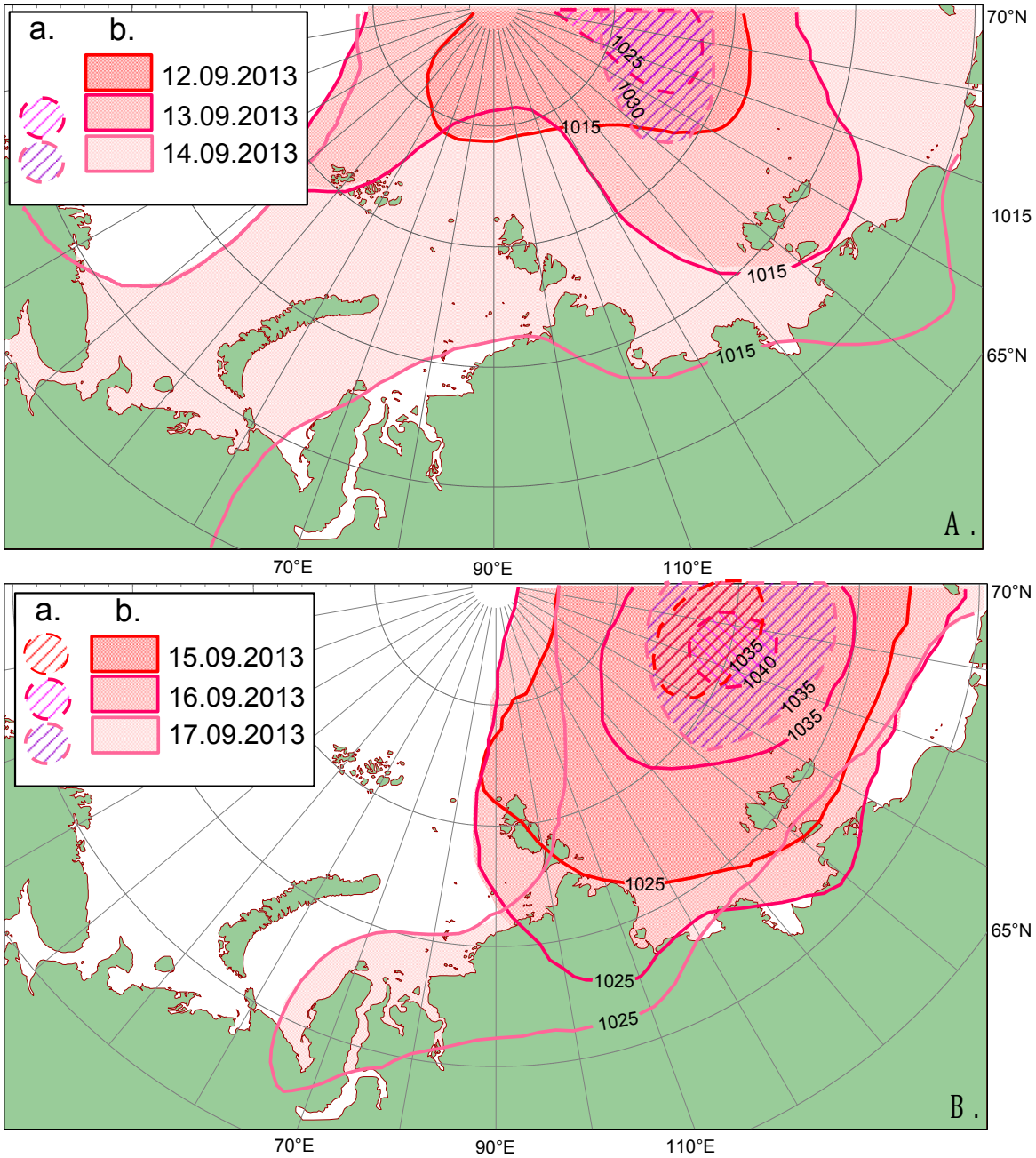


Fig. 12: Typical location of baric fields from September 12-14 (A) and 15-17 (B) (baric ridges). The 1,015-mb isobath indicates a border of high pressure fields (b). The areas with highest pressure (a.) are marked by a dashed line.

Ice conditions

As the ice conditions in the Vilkitsky Strait region were very important for the success of the expedition in reaching the Laptev Sea, our attention was focused on the ice conditions in the eastern part of the Vilkitsky Strait and in the eastern Kara Sea in the time interval of August (18)20 to September 3(10), the ice concentration and the location of ice floes are presented in ice maps:

- for the whole Kara and Laptev seas and toward the north (to 80°N) for August 18-20 and 25-27, and September 1-3 and 8-10 (Fig. 13).
- for Vilkitsky Strait and the eastern part of the Kara Sea for August 18-20 and 22-23 (Fig. 14), and for September 1-3 (Fig. 16);
- for the eastern Kara Sea for August 29-30 (Fig. 15);
- for the Laptev Sea for August 25-29 and 29-30 (Fig. 17).

When comparing the maps presented in Figure 13, it is possible to see that a narrow band of the weaker ice is located along the northwestern coastline of the Taymyr Peninsula after August 20. Taking into account Figure 14, we can see that this band still exists after August 23. It was formed by predominately eastern (southeastern) winds and positive air temperatures (see Figs. 15, 17A) This narrow band forms from August 22-29. The prevalent ice concentration here decreases from 4-6 scale units (40-60%) to 1-3 scale units (10-30%). After the wind had changed to northern and northwestern directions on August 29-31 (see Figs. 15, 17A), in the southwestern part, the ice was blocked by an ice dam with ice concentration of 7-8 scale units (70-80%) (Fig. 15). This dam formed from a former ice field with concentration of 9-10 scale units (90-100%), driven to this area by northern and northwestern winds.

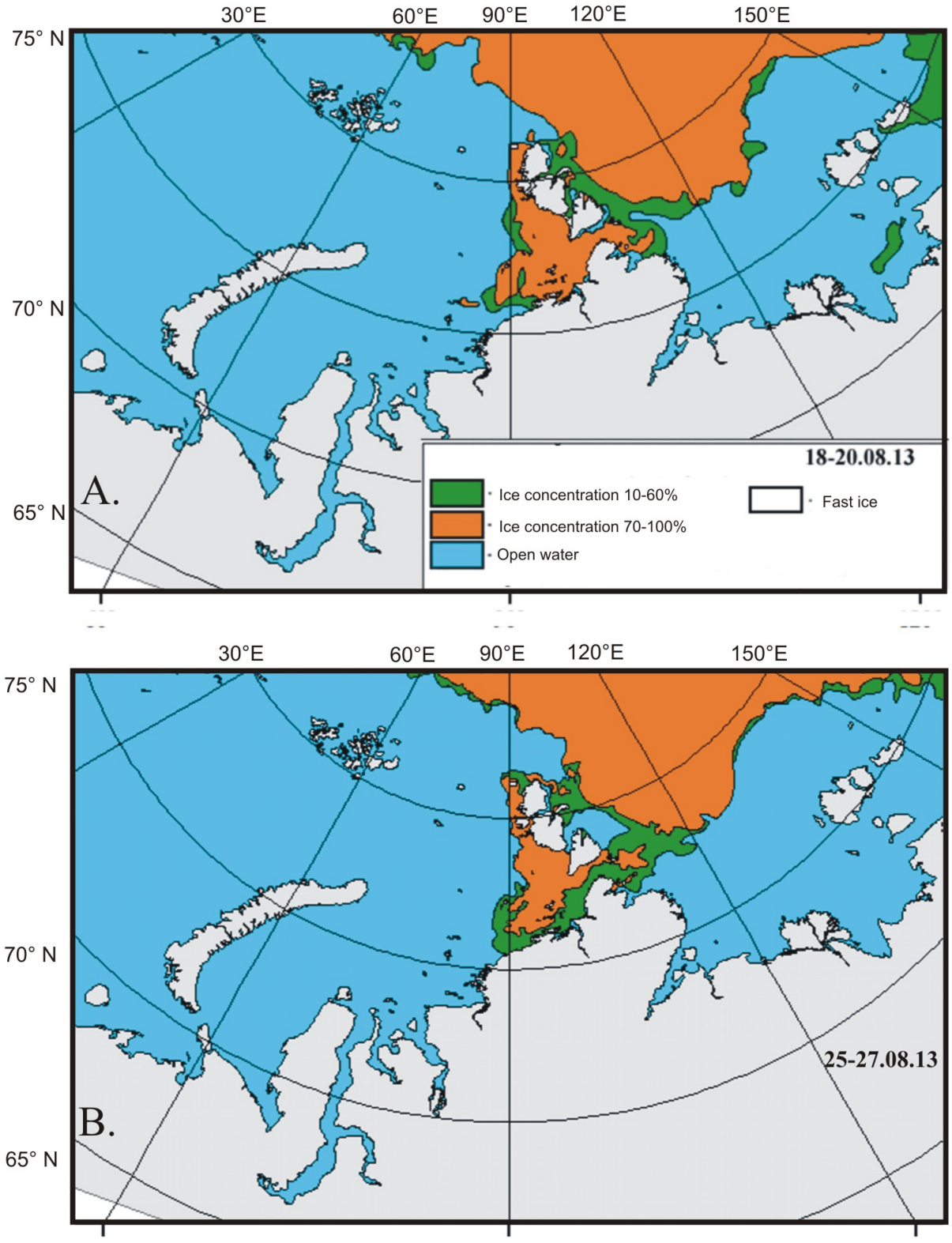


Fig. 13: Ice conditions in Kara and Laptev Seas from August 18-20 (A) and 25-27 (B), and from September 1-3 (C) and 8-10 (D) (continued on next page).

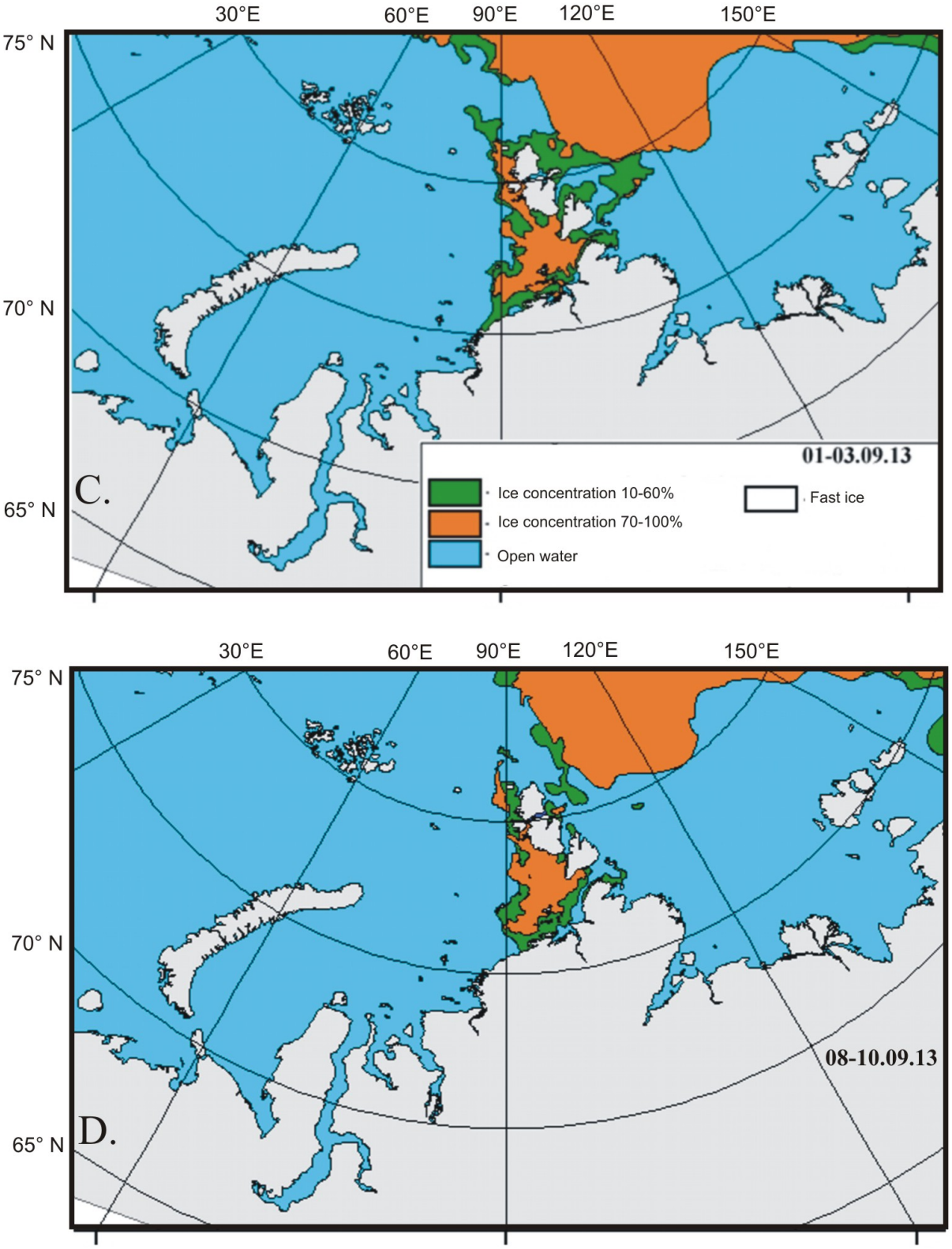


Fig. 13 (continued): Ice conditions in Kara and Laptev Seas from August 18-20 (A) and 25-27 (B), and from September 1-3 (C) and 8-10 (D).

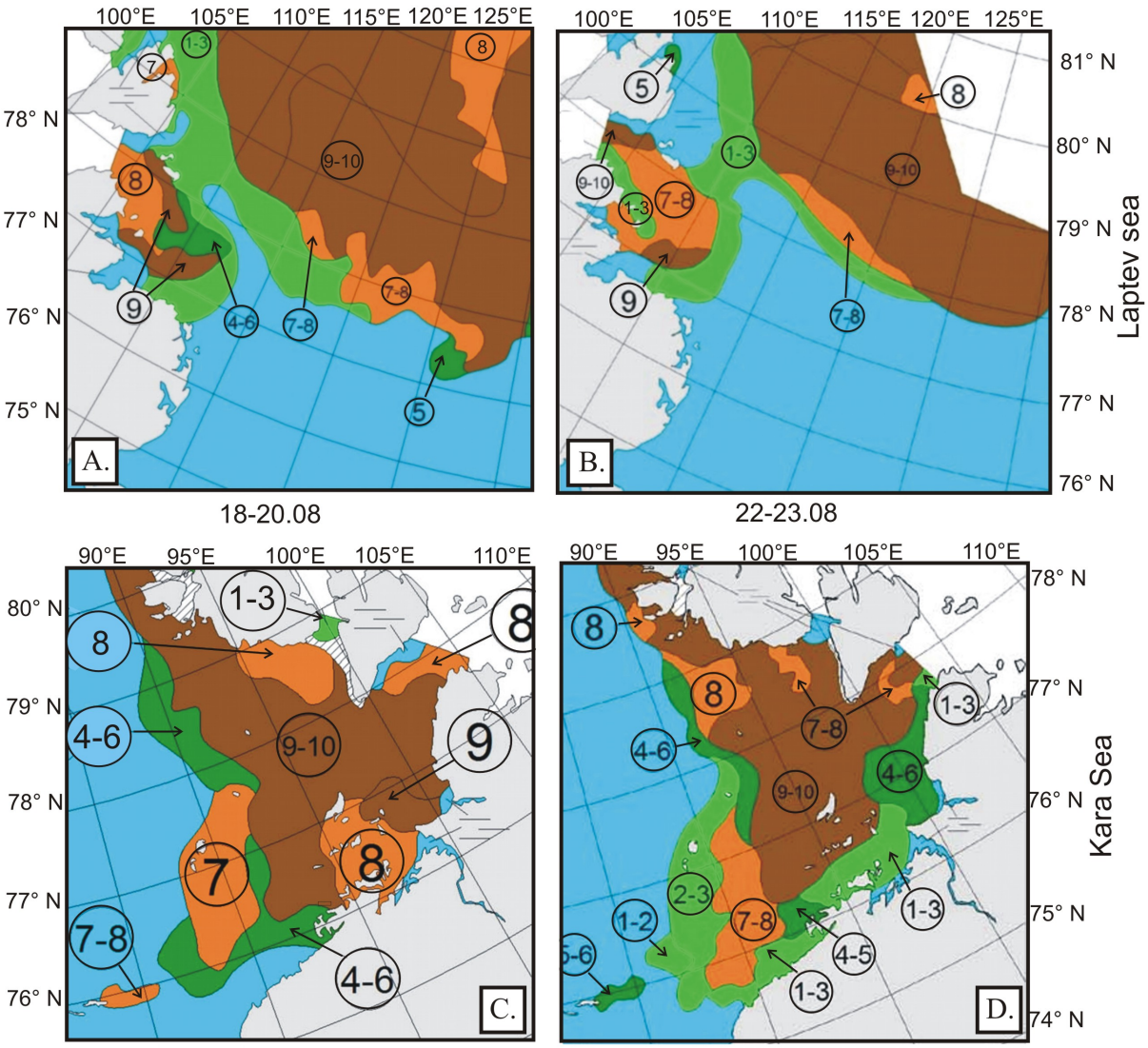


Fig. 14: Ice concentrations in the Kara (C, D) and Laptev (A, B) seas (Vilkitsky Strait region) from August 18-23 (18-20 (A, C) and 22-23 (B, D)). The figures stand for 1=10% etc.

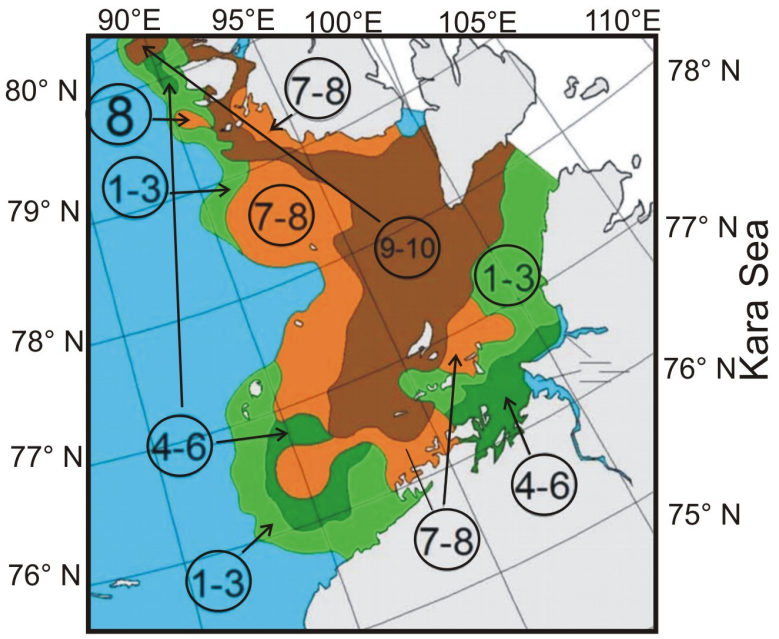


Fig. 15: Ice concentrations distribution in the Kara Sea (Vilkitsky strait region) 29-30.08. The figures stand for 1=10% etc.

When the ship was included into the convoy to safely negotiate the ice floes, the ice dam was partially destroyed due to positive air temperatures and southern winds after September 1 (see Fig. 10B). The ice belt along the coastline became weaker (Fig. 16B), in parts open water was recorded. The presence of ice fields with concentrations of 7-8 scale units (70-80%) and 4-6 scale units (40-60%) inside the ice dam made navigation through the Vilkitsky Strait without icebreaker impossible although the ice conditions along the ice belt seems negotiable after August 31. The complete destruction of the ice dam happened on September 8 at the least as shown in Figure 14D.

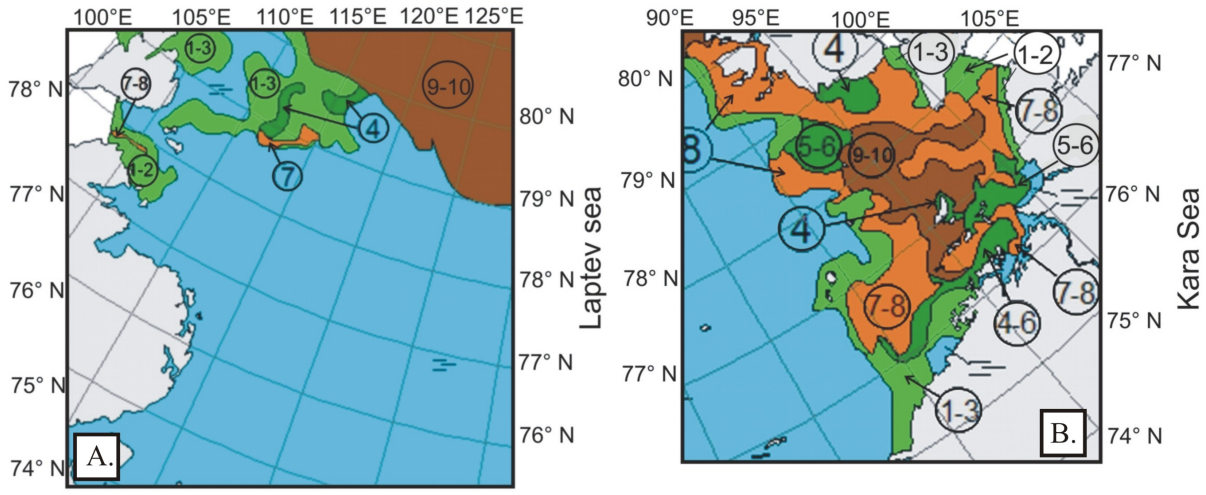


Fig. 16: Ice concentrations in the Laptev (A) and Kara (B) seas (Vilkitsky Strait region) from September 1-3. The figures stand for 1=10% etc.

The ice-field degradation in the eastern part of the Vilkitskiy Strait and the northern shift of the ice fields took place during the whole time interval as is shown in Figures 13, 14A,B and 10A,B. At the same time ice concentration decreased to 1-2 scale units (10-20%) and in parts open water was recorded (Fig. 16A).

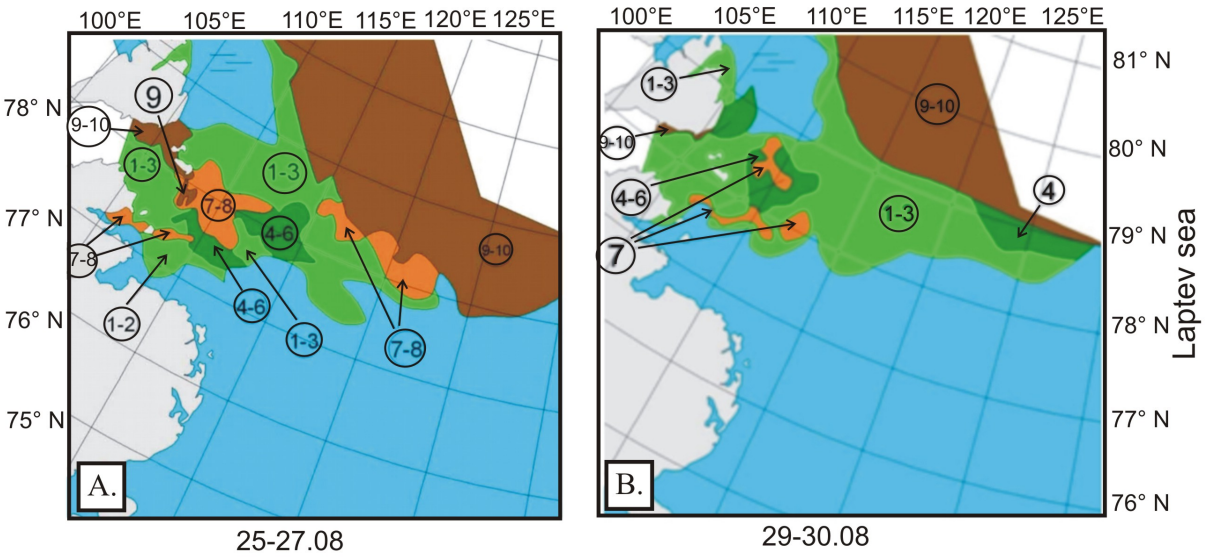


Fig. 17: Ice concentrations distribution in the Laptev Sea (Vilkitsky Strait region) from August 25-30 (A: 25-27, B: 29-30). The figures stand for =10% etc.

Summarizing, we can say that it is appropriate to mention here that the ice fields in the Laptev Sea were not significant obstacles to a successful realization of the expedition program. However, it was quite difficult to negotiate the ice fields in the eastern part Kara Sea near the Vilkitskiy Strait, which made escorting by a nuclear icebreaker compulsory.

OCEANOGRAPHY AND SEAFLOOR OBSERVATORIES

J. Hölemann, M. Janout
Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany

The Siberian shelves are regions where pronounced changes in the environment have been observed since the beginning of the 21st century. The warmer atmosphere and longer ice-free period result in more heat being accumulated in the surface, intermediate and bottom layers during summer. This heat is a plausible source for the reduced ice thickness in the subsequent winter. The Laptev Sea is also affected by warmer Atlantic waters (AW) penetrating the outer and inner shelves through the deep submarine canyons. Although the AW are insulated from the atmosphere by the halocline layer, these waters show an extreme increase in temperatures and are expected to present another potential source affecting sea-ice formation. However, the response of the Laptev Sea environment to the rapid Arctic changes has been insufficiently studied. Thus, the field activities during the TRANSDRIFT XXI expedition provide an opportunity to conduct scientific researches aimed to answer the following questions:

- are the observed changes of the Laptev Sea hydrography, like the significant increase in bottom water temperatures in 2009 and 2010, episodic events or do they reflect a sustained trend towards a warmer Laptev Sea?
- what are the effects of heat and salt fluxes from the Arctic Basin on the hydrography and ice regime on the Laptev Sea shelf?
- has the ice regime an influence on the density stratification of the water column, and thus on the vertical transport processes?
- what is the effect of vertical mixing on the geochemical fluxes and biological processes in the water column?

The oceanographic part of the program was based on 1) year-round oceanographic seafloor observatories and 2) a spatial survey of temperature and salinity profiles.

Seafloor observatories

In the remote Laptev Sea region, the only feasible method to gather data during winter, which is necessary to better understand the processes near the boundary between the ice, ocean and atmosphere, is by operating year-round seafloor observatories (Fig. 18). A seafloor observatory consists of a weight, anchored on the seafloor, attached to a float in order to provide a vertical line, which is used to attach measuring devices at selected depths. The instruments are programmed to record a year-round dataset with sampling intervals of ~30-60 minutes depending on the instrument and on battery capacities. For successful recovery, we used new Edgetech “Push-off Release systems”. These are established systems, specifically designed for operations in shallow water regions such as the Laptev Sea shelf. For our 2013 program, we serviced a total of four locations across the Laptev Sea to gather comprehensive information on sea-ice drift and thickness, ocean currents and hydrography, as well as on biogeochemistry. These locations include a central shelf location (1893, 45 m deep), as well as a location (TAYMYR, 59 m) dominated by on-shelf transport of waters from the shelf break, and an off-shelf flow region (KOTELNYY, 67 m). Additionally, for the first time we deployed a seafloor observatory (VILKITSKY, 320 m) in the submarine canyon adjacent to the northwestern Laptev Sea shelf.

The year-round observatory 1893 (the name honors the starting year of Nansen’s FRAM drift expedition in this region) is designed to obtain basic multidisciplinary information on the

conditions on the shelf. The list of instruments includes a ULS (upward looking sonar to record sea-ice thickness), ADCPs (ocean currents) and CTDs, fluorometers and turbity sensors, as well as a moored automated water sampling device. In particular the size and the technical requirements of both the ULS and the automated water sampler require separate observatory for these instruments, so that the 1893 location holds a total of three individual moorings. The on-shelf flow location TAYMYR consists of two moorings, one fully oceanographic observatory and one observatory operating a ULS. The processes at the northeastern KOTELNYY location are tracked by one oceanographic observatory. The deeper (320 m) oceanographic VILKITSKY observatory is designed to record currents and hydrography in order to improve the understanding of the role of the Kara Sea outflow and the dynamics in the submarine canyon and its potential impact on the northwestern Laptev Sea shelf. The construction details of the seafloor observatories are provided in Appendix C.

The seafloor observatory KHATANGA11, which was deployed in September 2011, was recovered successfully. The observatory consisted of a 300 kHz ADCP, two CTDs (SBE 37SMP) and two backscatter sensors (Seapoint) to determine the turbidity (see Appendix). Unfortunately the upper backscatter sensor (12.5 m above seabed) was flooded by seawater and contained no data. The CTDs recorded data until the instrument was recovered. The ADCP stopped recording in August 2013 and the second backscatter sensor finished the measurements in May 2013.

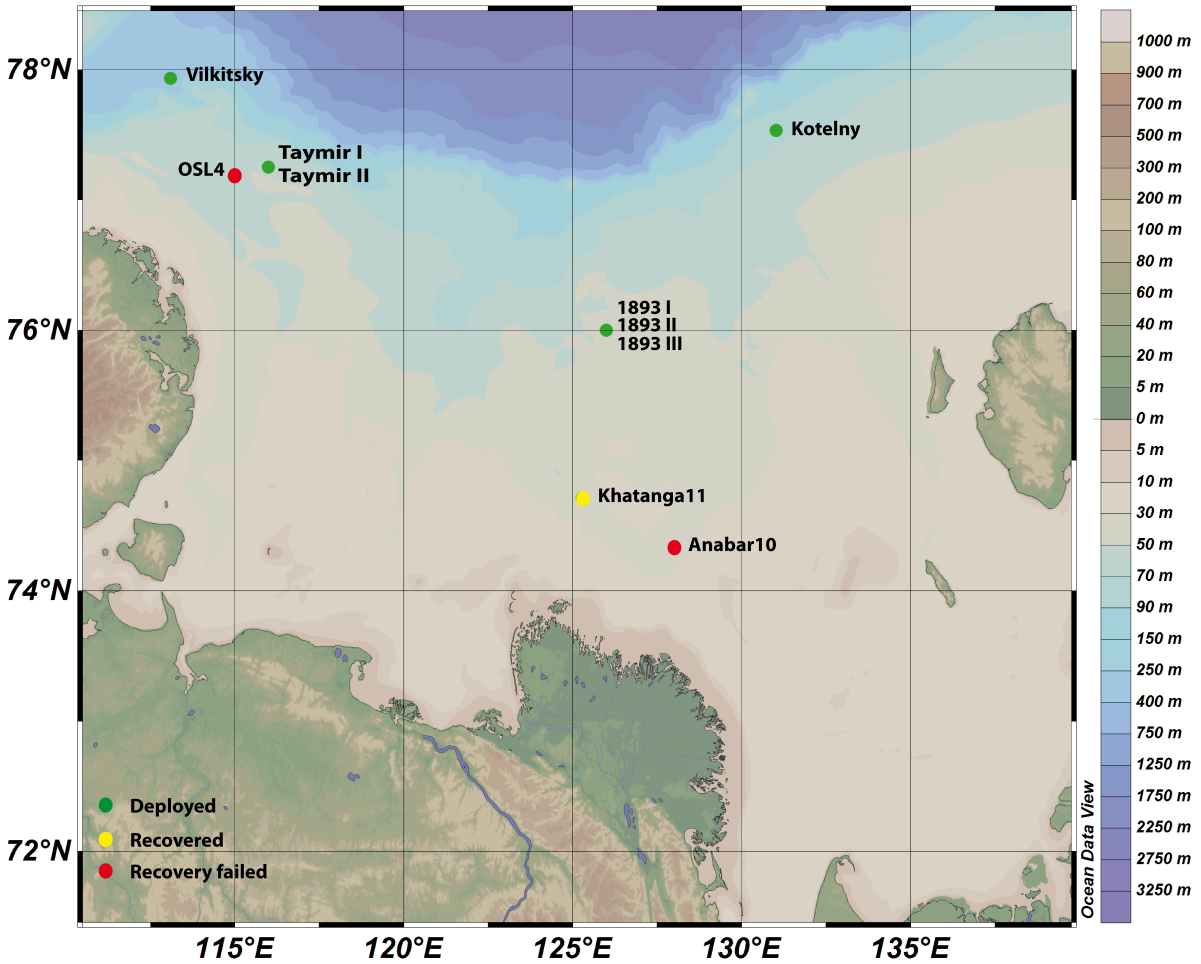


Fig. 18: All seafloor-observatory deployments are marked green while all successful recoveries are marked yellow. Red indicates the seafloor observatory that could not be recovered.

CTD measurements

During the TRANSDRIFT XXI expedition, we operated a Seabird CTD (conductivity-temperature-depth) profiler, which provided the basic physical water-column parameters, such as temperature, salinity and stratification (Fig. 19). Additional biogeochemical sensors record information on turbidity, fluorescence and CDOM in the water column. The CTD is operated on a rosette, which includes automated water samplers allowing for sampling at desired depths for biogeochemical analyses.

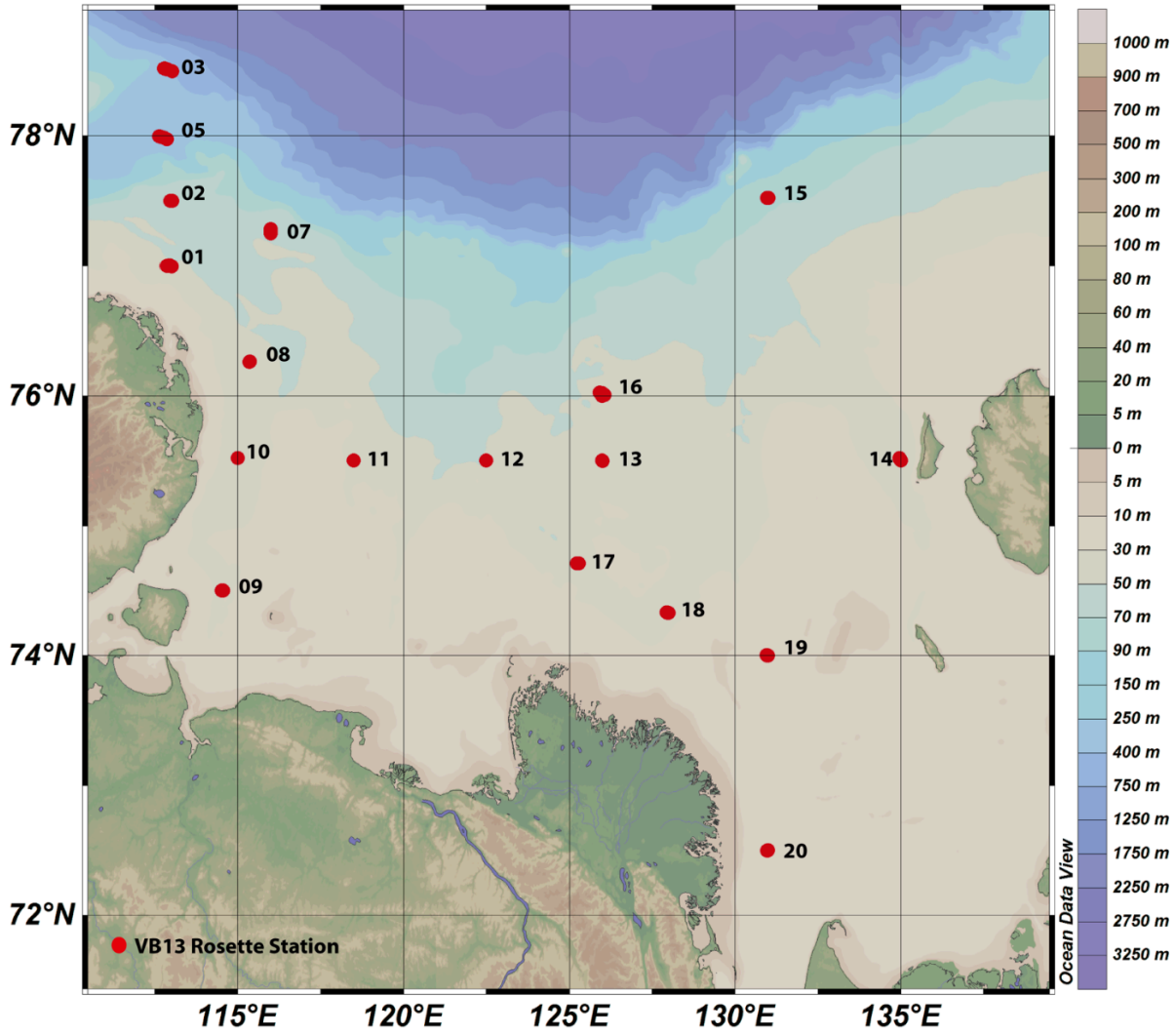


Fig. 19: Water sampling stations.

In addition to the CTD measurements during station work, an Underway CTD (Ocean Science) was used between the stations with an average sampling spacing of 5 nm (Fig. 20). The Underway CTD is a relatively recent development and designed to collect temperature and salinity profiles while the ship is en route, and hence has a low-cost potential to resolve small-scale features such as meanders or fronts between the fresh Lena river plume and "regular" outer shelf waters.

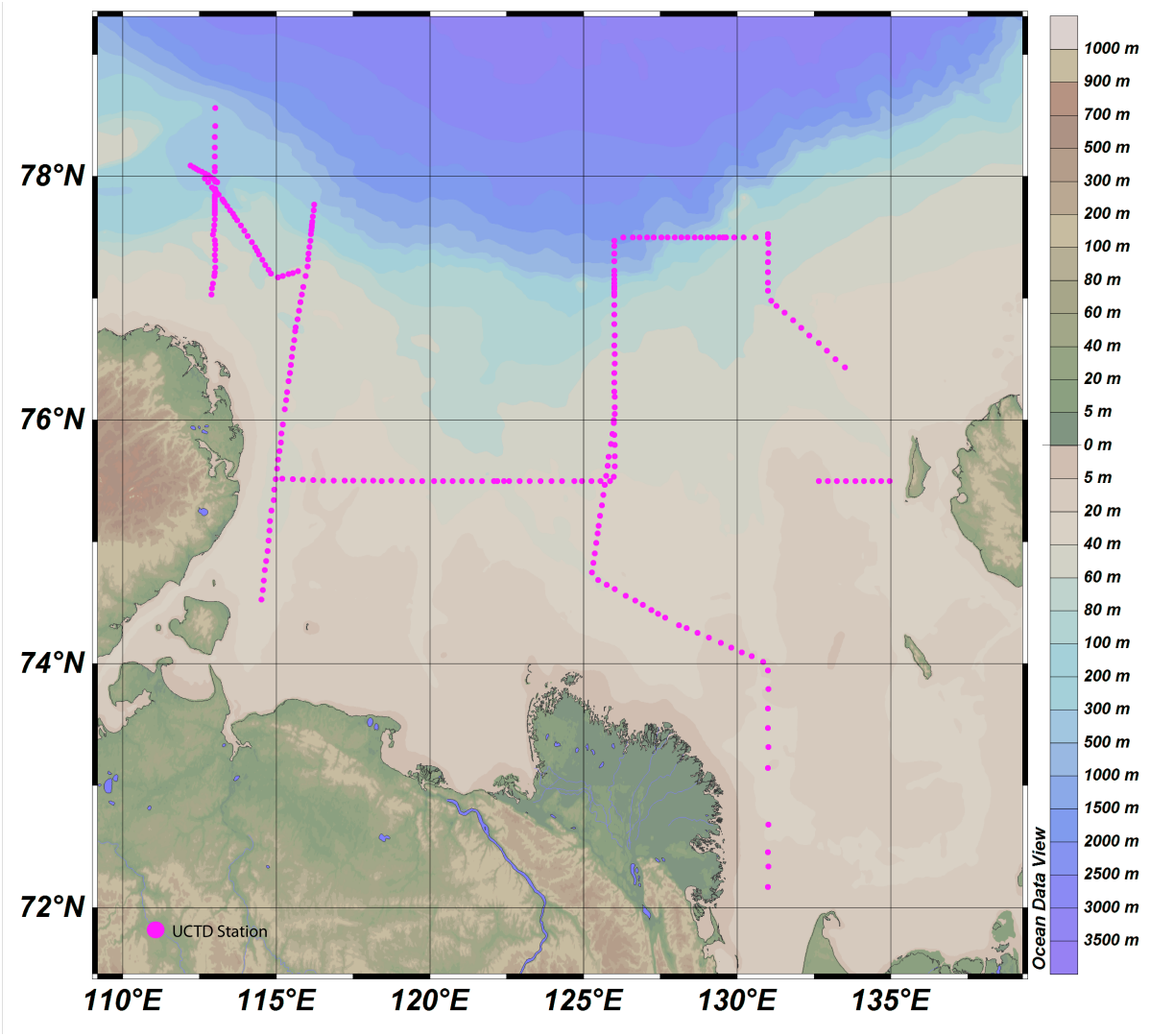


Fig. 20: Locations of the Underway CTD casts.

Methods and equipment

The investigations at the oceanographic stations included water sampling with the use of the following equipment: CTD probe SBE 19 plus, a programmable carousel water sampler SBE 32SC ("rosette") with 2.5 liter plastic water-sampling bottles, and a release for closing the water-sampling bottles at preprogrammed depth levels (AFM, Automatic Fire Module). The carousel water sampling was deployed from an A-frame installed midship on the portside.

The CTD SBE19+, system produced by Seabird Electronics Inc. (USA), continuously measures conductivity, temperature, dissolved oxygen, turbidity and chlorophyll at ~0.10 m depth intervals (assuming the 4Hz sample rate and the rate of decreasing ~30-40 cm/s). The measurement ranges of the CTD are -5 to 35°C for temperature, 0 to 9 S/m for conductivity, and 0 to 600 m for hydrostatic pressure (maximum operational depth). The accuracy is 0.005°C for temperature, 0.0005 cm/m for conductivity, and 0.1% of the total measurement range for the hydrostatic pressure. Stability (monthly) of the temperature sensor is 0.0002°C, that of the conductivity sensor is 0.0003 cm/m, and that of the hydrostatic pressure sensor 0.004% of the total measurement range. Resolution for temperature measurements is 0.0001°C, for conductivity measurements 0.00001 cm/m for freshwater, 0.00005 cm/m for seawater, and 0.00007 cm/m for highly saline water, and for hydrostatic pressure

measurements 0.002% of the total measurement range. The default frequency of profile measurements is four scans per second (4 Hz).

The probe is equipped with a fixed memory of 8 MB recording the measurement results. The interface is RS-232. Power supply is maintained by nine batteries (D-Cell) allowing for ~60 hours of profiling.

The instrument was equipped with additional sensors for measuring turbidity (Seapoint OBS), dissolved-oxygen concentration (SBE43) and colored dissolved organic matter fluorescence (WETlabs WETstar) and chlorophyll (WETlabs WETstar)

The Underway CTD uses a custom freefall CTD probe manufactured by Sea Bird Electronics. The internal electronics and exposed sensor components are designed to withstand deployment and recovery at up to 20 kts. Sampling at 16 Hz, overall depth resolution of below 25 cm is attained at a drop speed of about 4 m/s. The specifications of the CTD probe sensors are shown in Table 1.

Table 1: Specification of the Underway CTD

	Conductivity (S/m)	**Temperature (°C)**	**Depth (dbar)**	**Salinity (psu)**
Resolution	0.0005	0.002	0.5	0.005
Accuracy: raw data	0.03	0.01-0.02	4	0.3
Accuracy: processed data	0.002-0.005	0.004	1	0.02-0.05
Range	0-9	-5 to 43	0-2000	0-42

Profiling down to 350 m was carried out without the tail spool reloading phase and the probe was dropped from the ship with line spooling off the main winch only. For deployment in 15-100 m water depth, a buoyancy module (Fig. 21) was installed on the tail spool to slow the probe descent rate from 4 m/s to 1 m/s.

Fig. 21: Deployment of the Underway CTD with slow-fall profiler (orange collar) from stern.

OCEANOGRAPHY – FIRST RESULTS

Compiled by L. Timokhov
Arctic and Antarctic Research Institute, St. Petersburg, Russia

The oceanographic conditions in the Laptev Sea at the time of the TRANSDRIFT XXI expedition formed as a result of the influence of atmospheric processes, ice melt and retreat of the ice edge, the thermal conditions in the surface layer and water circulation. Our investigations started in the northwestern part of the Laptev Sea on September 2, 2013 and ended in the southern part of the sea in the Buor Khaya Gulf on September 17. Figure 22 shows the position of the oceanographic stations with the numbering of the oceanographic transects.

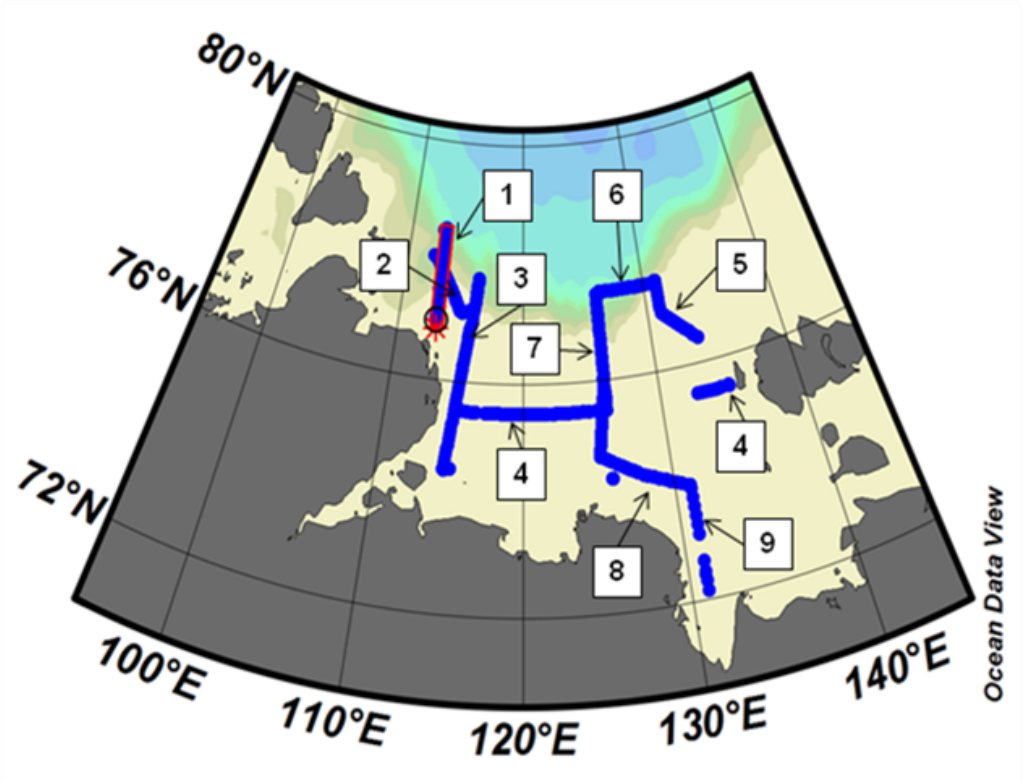


Fig. 22: Numbers of the oceanographic transects, carried out during the TRANSDRIFT XXI expedition from September 2-17, 2013.

Thermohaline conditions of the surface water layer

The temperature and salinity distribution in the surface water layer of 0-5 m in the Laptev Sea is a result of the influence of atmospheric processes, ice melt and retreat of the ice edge, the thermal conditions in the surface layer and interaction with lower water layers. Figure 23 presents maps of the temperature and salinity distribution in the surface water layer according to the data of the TRANSDRIFT XXI expedition from September 2-17, 2013. It must be noted that in compiling the maps, we used an averaging radius that does not allow showing all details of temperature and salinity variations. For the description of the thermohaline conditions of the surface layer, therefore, we used not only the maps from Figure 23, but also data of measurements at the hydrological stations.

The temperature and salinity in the surface water layer of the Laptev Sea is described below. In the northwestern part of the sea (Fig. 23; Transect 1 and the northern part of Transect 2), the oceanographic stations were carried out close to the ice edge from September 3-6. The

temperature, therefore, was low (0-1.5°C). Toward the south along transects 1 and 2 in the ice-free water area, the temperature of the surface layer increased to 1.6-1.8°C. Salinity in this region was slightly higher than usual because during July, more saline surface waters from the Arctic Basin entered the sea. A patch with low salinities of 27-28 formed in the northern part of Transect 1 as a result of the melting of drift ice. Along the meridional Transect 3, the temperature in the surface layer increased from north to south from 3.0-3.5°C to 4.2-4.5°C. Such high water temperatures occurred as a consequence of the currents of atmospheric heat, which was anomalously intensive in July and slightly less so in August. The salinity of the surface layer in the northern part was 28.7.

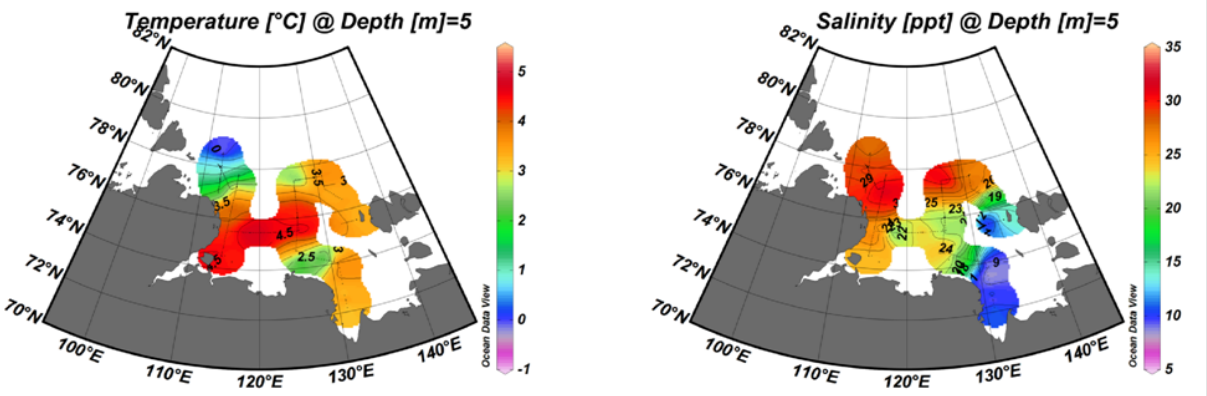


Fig. 23: Temperature and salinity distribution in the surface water layer according to the data of the TRANSDRIFT XXI expedition from September 2-17, 2013.

In the central part of the sea on the meridional Transect 4, the water temperature of the surface layer was anomalously high, and considerably higher than usual. It was higher than 4°C, reaching 4.93°C. These high water temperatures were also due to the influence of the currents of atmospheric heat that was anomalously intensive in July and slightly less so in August. Salinity in the western part of the sea was slightly higher than normal and varied between 25.00 and 27.33 at the longitude 115.864°E. Then it quickly decreased to 19.63, probably due to the freshening by river waters from the Khatanga and Olenek rivers. From the longitude 120°E toward the east as far as to 126°E, salinity varied between 22 and 24. In the vicinity of Bel'kovskii Island, the water temperature of the surface layer was lower than in the central part of the sea. These lower temperatures were probably caused by a storm event as a consequence of which the warm surface waters were mixed with colder bottom waters.

In the northeastern part of the sea, the temperature in the surface layer along the Transect 5 was rather homogeneous and varied between 3.17 °C (in the middle part of the transect), 3.52 and 3.70°C (in the northern and southern parts of the transect, respectively). Salinity ranged from 11.39 in the south to 27.84 in the northwestern part of the transect. In the northern part of Transect 6, surface temperatures and salinities of 3.51°C and 26.87 were observed in the east and of up to 2.65°C and 31.55 at the western end of the transect with temperature decreasing to 1.69°C and salinity increasing to 31.81 at 127°E.

On Transect 7 along 126°E, the temperature at the surface varied from 3.48°C in the southern part of the transect to 4.48°C in the central part and decreased down to 2.64°C in the northern part. Salinity at the surface was 23.26 in the southern part of the transect, 21.72 in the central part and 31.19 in the northern part. The low salinity of the surface layer in the central part is due to the distribution of freshened waters from the Khatanga River.

On Transect 8 in the southern part of the sea, northeast of the Lena Delta, temperature and salinity of the surface waters ranged from 3.42°C and 24.72 in the western part of the transect to 1.60-2.20°C and 18.21-13.48 at 129°E. On Transect 9, west of the Lena Delta, temperature

and salintiy varied from 2.88°C and 11.10 in the southern part to 3.87°C and 7.78 in the northern part. At a distance of 22 km from the starting point of the transect in the northern part, salinity decreased to 6.39 for 40 km. Further on, it increased. This core of lower salinity with a width of 45 km and a thickness of c. 8 m was a branch of river runoff, probably from the Tumatskaya Channel of the Lena River. At 72°30'N, we also observed a patch with lower salinity (down to 7.45), which was probably linked to runoff from the Lena River through the Trofimovskaya Channel.

For estimating the thermohaline conditions of the surface layer of the Laptev Sea in summer 2013, we calculated the temperature and salinity anomalies of the 5-to-10-m surface layer against mean climatic values for the time period of 1950 to 1993. The maps we compiled are provided in Figure 24. From the calculations it can be seen that the surface water temperature in the Laptev Sea was universally higher than the mean long-term values. The highest temperature anomalies were observed in the central part of the sea where positive anomalies amounted to 3°C.

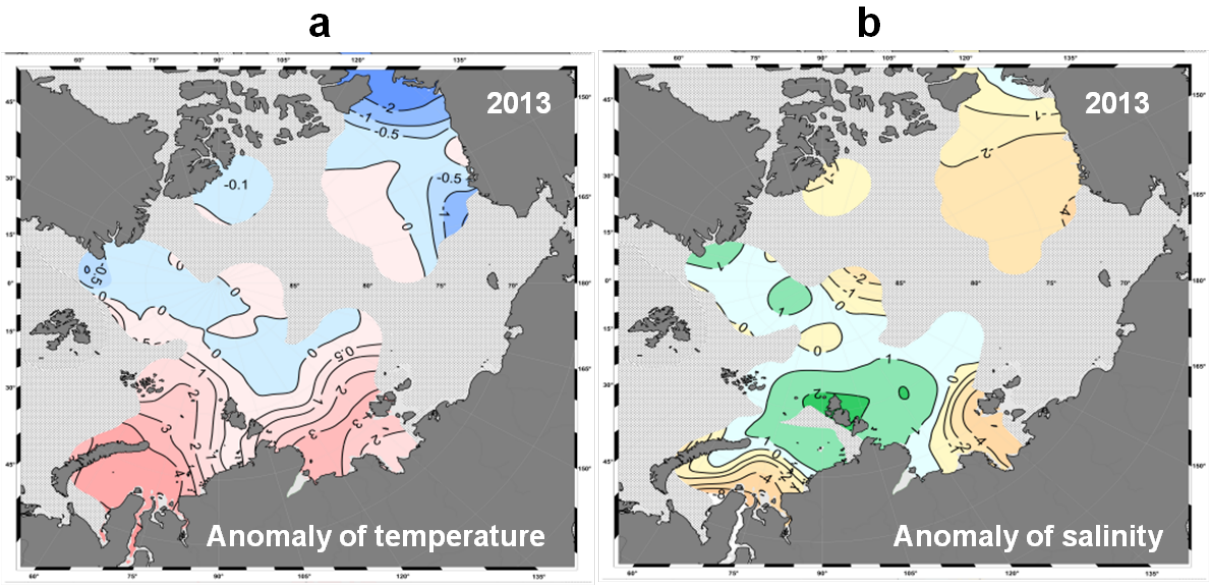


Fig. 24: Temperature and salinity anomalies in the 5-to-10-m surface layer for summer 2013, calculated against the mean climatic values for the period of 1950 to 1993.

The salinity anomalies in the northwestern part of the Laptev Sea were positive, i. e., the salinity, observed in this region, was slightly higher than the mean climatic value. In the southeastern part of the sea, salinity was lower than ususal. The positive salinity anomalies reached values of 4. This means that in this region, the most intensive freshening of the surface waters was observed.

Thermohaline conditions of the water masses of the northwestern part of the Laptev Sea

For the analysis of the vertical thermohaline structure in the upper layer, we chose the most variable layer of 0-90 m. For estimating at which depth the pycnocline and the thermocline are located, we calculated the vertical gradients of water density and temperature. The thickness of the surface layer is considered as the depth at which the highest values of the density gradient are found or the Brunt-Väisälä frequency, which is proportional to the density gradient. The thermocline is associated with the maximum value of the vertical temperature gradient.

The vertical temperature and salinity distribution along transects 1-3 was the following. The

surface layer in the northern part of Transect 1 (Fig. 25), which was located close to the edge of the melting ice, was thin (c. 5-7 m) and cold (0.38-0.43°C) and of relatively low salinity (28.31-28.82). In this area, the influence of the freshening of the surface layer as a result of ice melt manifested itself. Toward the south, the thickness of the surface layer along Transect 1 increased up to 10 m, and the temperature increased up to 2°C. Along Transect 1, we can distinctly see the thermocline, which was located in the northern part at a depth of c. 7-8 m and which, from 78.4°N onward, was found at increasing depths of up to 25 m. At latitude 77°N at the depth of 12 m, we observed a patch of warmer water with a maximum temperature of 2.52°C. The observed inversion ot temperature in this patch was due to cooling of the water at the surface – after all, the dates of September 5-6 mark the end of the summer processes and the beginning of the fall processes in the Laptev Sea.

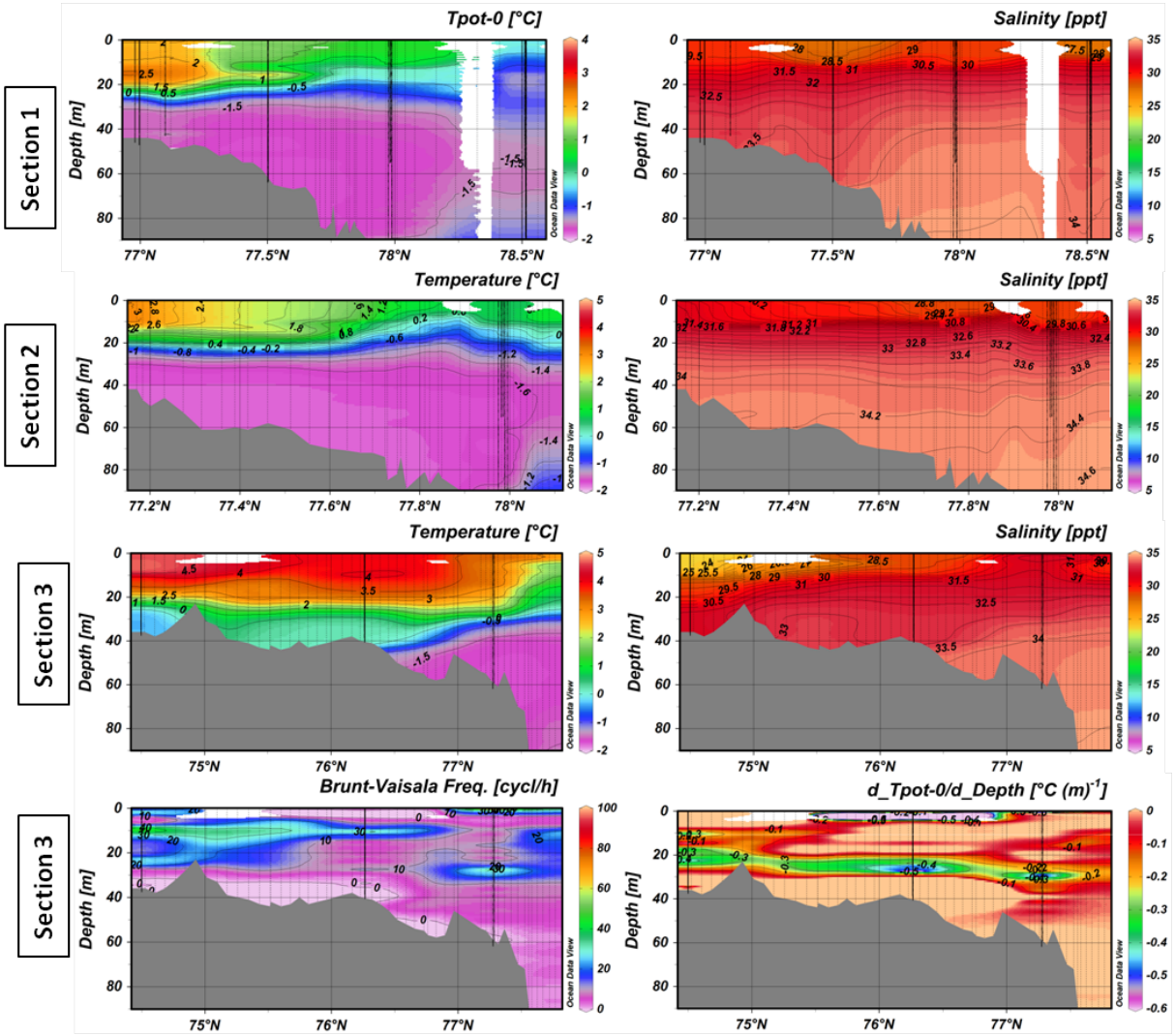


Fig. 25: Vertical temperature (left column) and salinity (right column) distribution along transects 1-3 in the 0-to-90-m layer. In the bottom row, we show as an example the calculated Brunt-Väisälä frequency [*cycl/h*], the proportional value of the vertical density gradient, and the vertical temperature gradient (*d_Tpot_0/depth [0°C (m)$^{-1}$]*) on Transect 3.

Along transect 2 from its northern part to 77°43.4'N, the surface temperature did not exceed 1°C and salinity was approximately 30. Further to the southeast, the surface temperature increased and at the southeastern end of the transect it reached 3.21°C while at the depth of 6-8 m, temperature made up 3.46°C. Salinity increased insignificantly and varied between 31.21-31.88 at the final southern station in the surface layer. The thickness of the surface

layer made up 10-12 m in the northern part of the transect. In the region from 77°54.7'N to 77°50.9'N we observed a local patch of colder and more saline water, and the thickness of the upper layer decreased to 5-6 m, but then increased rapidly to 8-12 m. The thermocline was located deeper than the halocline by 7-8 m in the northern part of the transect, and in the central and southern parts by 6-10 m. It can be assumed that earlier the surface layer was 6-10 m thicker than at the time of the measurements. Then a slight freshening event happened, which caused the maximum density gradient to shift to lesser depths. If we take into consideration the existence of the patches of warmer waters at the depth of 5-10 m in the southern part of the transect, then we can draw the conclusion that by the time when we carried out our measurements, the upper 0-to-5-m layer had cooled by 0.26°C as compared to the maximum heat content of the layer.

The temperature of the surface layer on Transect 3 was relatively low with c. 1°C in the northern part (Fig. 25). Further to the south, the temperature increased and reached 3.76°C at 77°N. In the central and southern parts of the transect, the temperature was anomalously high and reached 4.8°C. In the northern part of the transect, salinity was 28.75 and increased to 31.81 at 77°16'N. The salinity distribution was influenced by freshening due to ice melt since two weeks before, the ice edge had been located in the area of this part of the transect. Further to the south, salinity decreased and in the southern part of the transect made up 24.37. This region was influenced by the runoff of the Khatanga River. The thickness of the surface layer on Transect 3 ranged between 8 and 12 m. The thermocline was located at depths of 20-30 m but in the southern part, we observed two thermoclines. Such a vertical temperature and salinity structure was the result of several weather periods of warming and cooling.

A more frequent profiling of the water column allowed establishing several peculiarities of the layer of cold shelf waters at the continental slope during its degradation. Figure 26 presents the vertical temperature and salinity distribution in the deep-water part of transects 1-3. For describing the distribution of the cold shelf waters, we plotted the vertical distribution of water temperatures ranging from -1.8 to -1.4°C for each transect (middle column in Fig. 26).

On Transect 1, in the cold water mass, temperature was below -1.60°C. The upper boundary was found at the depth of 33-50 m and the layer extended over 145 km from the southern part of the transect to 78°16'N. On the shelf part at the seafloor, temperature made up 1.61 to -1.75°C and salinity ranged from 33.60-34.32. In the southern part of the transect, the layer was thin with 3-4 m. Its thickness increased at a distance of 60 km to 27 m, and the maximum thickness of 48 m was observed at the shelf edge. Beyond the shelf edge, we found a separate mass of shelf waters, which are marked with green color in Figure 26. One part of it moved down the slope to depths of 229 m where water temperature and salinity made up 1.60°C and 34.63, respectively. The other part continued to extend itself toward the north at depths from 42 to 100 m at a distance of 10 km from the shelf edge. At 29 km from the shelf edge at 78°10'N, the layer thinned out at the depth of 47 m.

On Transect 2, the upper boundary of the bottom layer of the cold shelf waters with temperatures below -1.60°C was located at the depth of 30 m in the southern part and sank to 36 m at 78°N (Fig. 26). At the shelf edge, the upper boundary sank to considerably greater depths. The thickness of the bottom layer of the cold shelf waters amounted to 12-17 m in the southern part of the transect and to 50 m at the shelf edge. On the shelf, at the seafloor, temperature and salinity ranged from -1.76 to -1.75°C and 34.21-34.45, respectively. From the diagram of temperature distribution in the deep-water part of the vertical Transect 2 in Figure 26, we can see that at the shelf edge, the mass of shelf waters divides into two parts. One of them sinks along the slope to depths of 180-200 m and the other one continues to extend toward the north at depth of 42-80 m at a distance of 20 km from the shelf edge.

Figure 26 shows the water temperature profile in the range of -1.8 to -1.4°C at which we can clearly see that at the depth of 90 m at a distance of 4 km from the shelf edge, the separation of the cold shelf waters takes place.

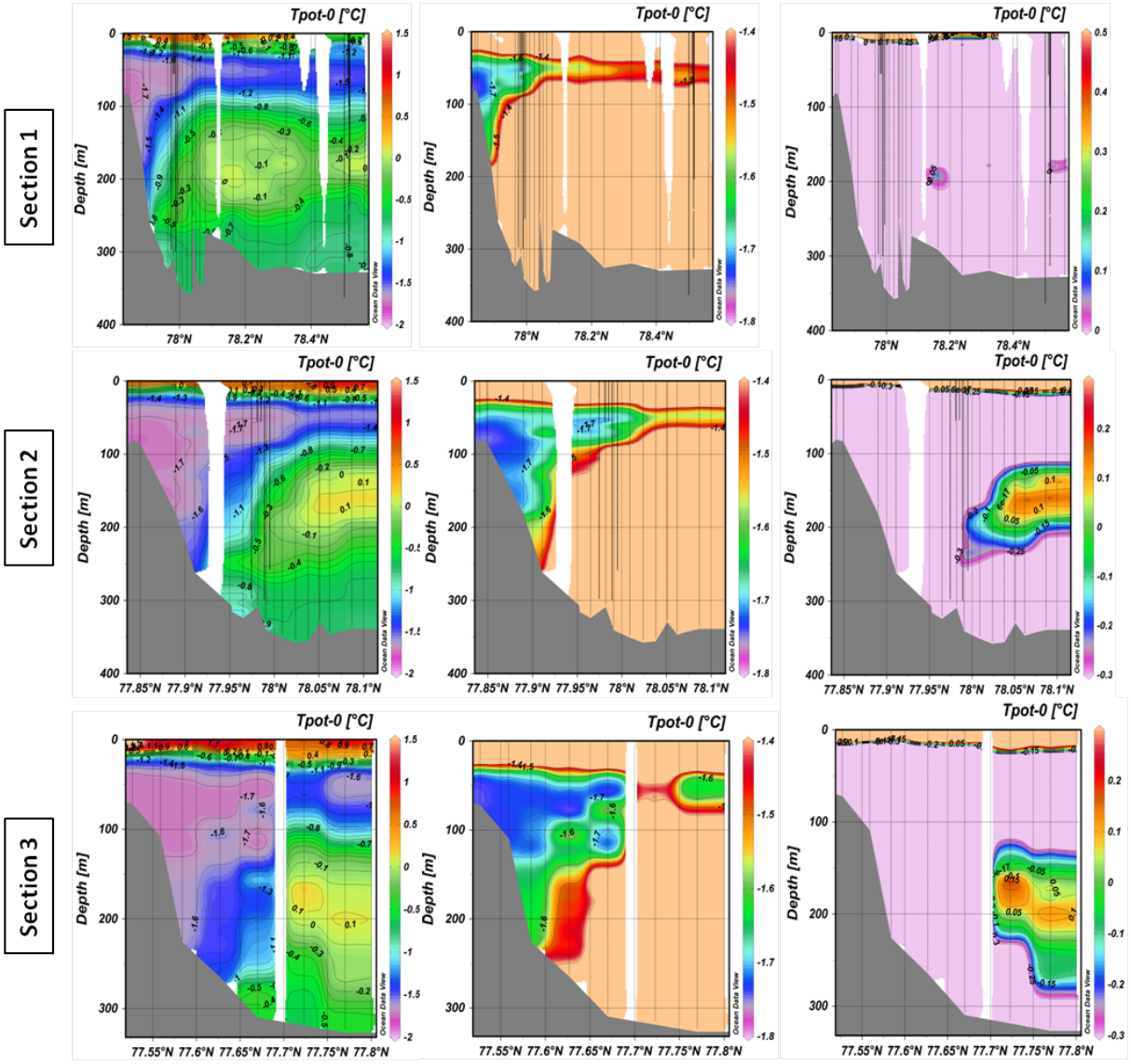


Fig. 26: The deep-water part of the vertical temperature and salinity distribution on transects 1-3 (left column). For describing the distribution of the cold shelf waters, we plotted the vertical distribution of water temperatures ranging from -1.8 to -1.4°C for each transect (middle column). For determining the warm (higher than 0°C) Atlantic Waters, we plotted the vertical temperature distribution in the range of -0.3°C an 0.3°C (right column).

On Transect 3, at the seafloor at the shelf edge, the temperature was -1.76°C and salinity 34.23 (Fig. 26). At the edge, the upper boundary of the cold shelf waters was located at the depths of 30-34 m. The sinking cold waters extended over 11.6 km at the depth of 78 m and over 7.7 km at the depth of 138 m. On the continental slope they reached depths of 224 m. At depths of 50-60 m, part of the cold shelf waters extended toward the north for 15-18 km from the shelf edge. Then there is a gap and at the following northern station, we registered once more a small patch of cold waters at depths from 38 to 67 m.

This large volume of saline and cold water that was observed on transects 1-3 formed on the Laptev Sea shelf in winter. Its source was above all the zone of the polynya where cooling and salinization of the surface waters, subsequently reaching the seafloor as a result of winter convection, took place. It must be noted that the phenomenon of such a considerable volume

of cold and saline waters on the shelf is not often observed.

Below the layer of the shelf waters, our measurements detected a zone of transformed waters of Atlantic origin, which were in contact with the shelf waters. As can be seen from the temperature distribution on Transect 1 (Fig. 25, right column), in the northern part at the depth of 170-180 m, there is an inflow of waters of Atlantic origin with a temperature above 0°C. In the northern part of Transect 2, water of Atlantic origin occurred in the layer from 126-184 m with a maximum temperature of 0.30°C. The frontal zone of the Atlantic Waters was located at a distance of 29 km from the shelf edge. The Atlantic-water layer was 50-60 m thick and comprised one fifth of the water column. It extended along the transect for 18 km. In this layer at the depth of c. 150 m, there was a patch of water with a temperature above 0.15°C, which was separated from the main Atlantic water mass. The diagram in the bottom row and in the right column of Figure 26 provides an image of the configuration of the zone of Atlantic Waters on Transect 3. Their frontal zone was located 15-18 km from the shelf edge. As we can see, in the frontal zone, there is a patch of warmer waters with a temperature of up to 0.30°C at the depth of 166 m. At the last station of the transect, which was situated 4 km further north than the last but one station, where the above-mentioned temperature of Atlantic Waters was observed, the highest temperature was 0.15°C at the depth of 193 m. The separate branch of Atlantic Waters in the northern part was 50-55 m thick. It extended for c. 4-5 km and ended at a distance of 15-18 km from the shelf edge.

Thermohaline conditions of the water mass of the northeastern part of the sea

In the northeastern part of the sea, we carried out our observations from September 13-15. A peculiarity of the vertical distribution of the oceanographic characteristics on Transect 5 was the existence of two haloclines. The lower one was located at a depth of 20-21 m and stretched over 91 km from the southern part of the transect to 77°08'N, 131°E. Further on the depth of the halocline gradually decreased to 16 m at the end of the transect. The depth of the halocline coincided with that of the thermocline. This structure was probably the result of the summer processes and the halocline must be considered as seasonal. Over the seasonal halocline in the southern part of the transect, we observed another halocline at the depth of 9-10 m. It extended for c. 50 km and ended at the point where freshened river runoff had an influence on the surface waters. This halocline was linked to the position of the river plume and its position was probably a result of the influence of atmospheric weather processes.

In the bottom layer, temperature and salinity varied with depth from -1.20°C and 32.89 in the southern part to -1.26°C and 33.90 at 77°08'N at a depth of 58 m. Further to the north, temperature at the seafloor decreased and salinity increased. At the final station of the transect at a depth of 64 m, temperature and salinity made up -1.40°C and 34.17, respectively. If we compare this with the temperature and salinity values at the same depth on the western transects (1-3), we can see that in the eastern part of the sea at the shelf edge, the bottom temperature was by 0.20-0.26°C higher while salinity varied only insignificantly.

On Transect 6, temperature and salinity at the surface ranged from 3.51°C and 26.87 in the east to 2.65°C and 31.55 at the western end of the transect with a decrease in temperature of up to 1.69°C and an increase in salinity of up to 31.81. at 127°E (Fig. 26). With depth, temperature decreased and salinity increased. The thickness of the surface layer at the starting point of the transect up to 129°30'E comprised 12-14 m. At this depth, temperature and salinity ranged from 3.10-3.70°C and 28.46-30.19. At longitude 129°30'E, there was a sudden change in density at the depth of 5-6 m with a temperature of 3.22-3.32°C and a salinity of 27.80-29.04. The thermocline was located 2 m below the halocline, but at the depth of 25-27 m there was a second thermocline. Both of these sudden changes of density were linked to the fact that more freshened waters spread from east to west at the surface up to 128°E. Further to

the west, the halocline and the thermocline were located practically at the same depth of 22-26 m. Temperature and salinity ranged from 0.19-0.93°C and 31.94-32.29. Below the thermocline and the halocline, water temperature decreased and salinity increased. At the shelf edge at the depth of 70 m, we observed a temperature of -1.60°C and a salinity of 34.33 at the seafloor. From the edge, there was a plume of colder, probably winter, waters within the isotherms of -1.5°C. Within this plume of a thickness of c. 30-40 m, the lowest water temperatures reached -1.75°C and salinity ranged from 33.86-34.35. Density was 27,252-27,646 kg/m^3. This was lower than the salinity and density of the shelf waters in the deep-water part of Transect 3.

On Transect 7, the temperature at the surface increased from 2.54°C in the northern part to 4.48°C in the central part (Fig. 27). The vertical temperature distribution south of 76°30'N is notable for an inversion of temperature because at the depth of 10-12 m, there is a lense of warmer water with a maximum temperature of 4.57-5.05°C. This lense of temperatures above 4.5°C was approximately 5 m thick and stretched for 110 km. These lenses are the result of summer warming and mixing in the surface layer and the lower temperature at the surface provides evidence of the beginning of the fall cooling.

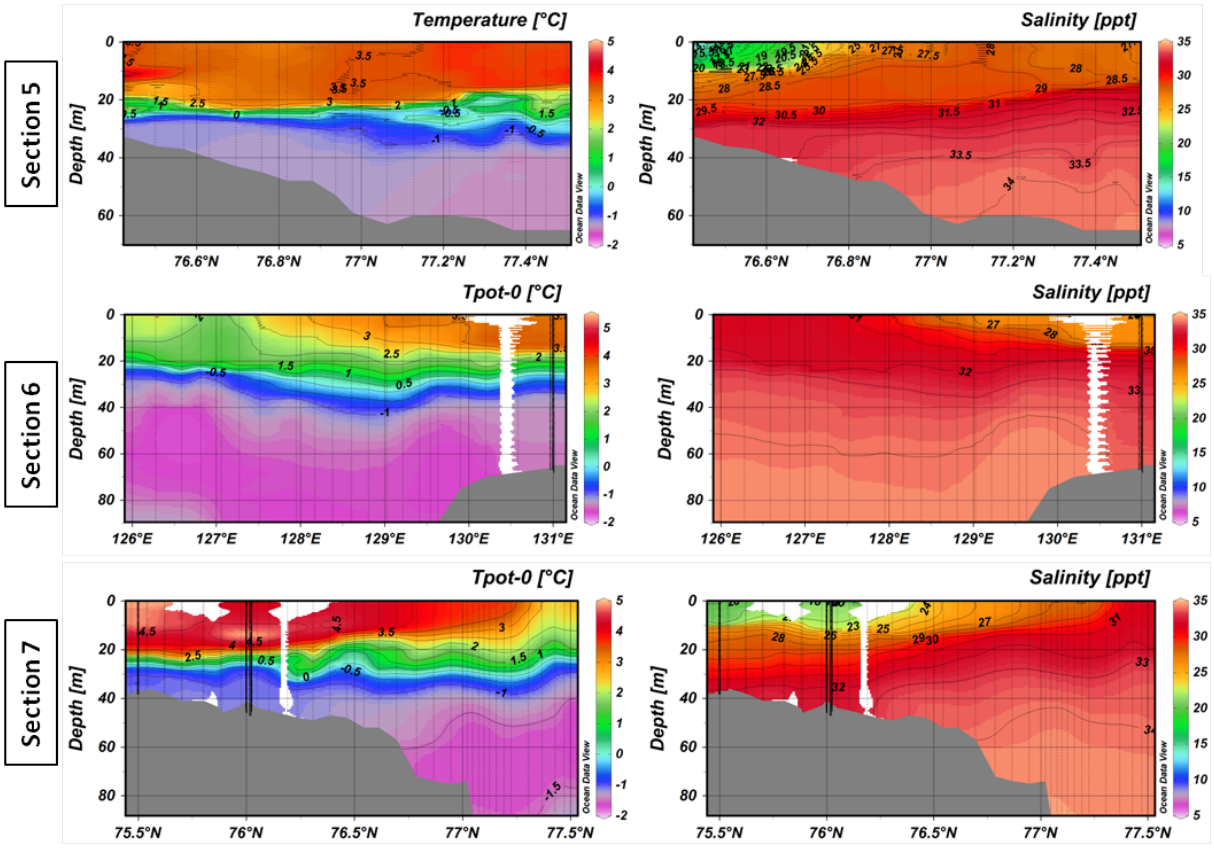


Fig. 27: Vertical distribution of temperature (left column) and salinity (right column) on transects 5-7 in the 0-to-90-m layer.

In the north, salinity at the surface made up 21.19 and in the central part 21.72. The low salinity of the surface layer in the central part of Transect 7 is due to the distribution of freshened runoff from the Khatanga River.

For a detailed description of the thermohaline structure in the deep-water part we compiled a diagram of the vertical temperature and salinity distribution (Fig. 28) in the deep-water parts of transects 6 and 7. Also Figure 28 shows the cold shelf waters in the range of -1.8 to -1.4°C and the warm waters of Atlantic origin in the range of -0.4 to 2.0°C.

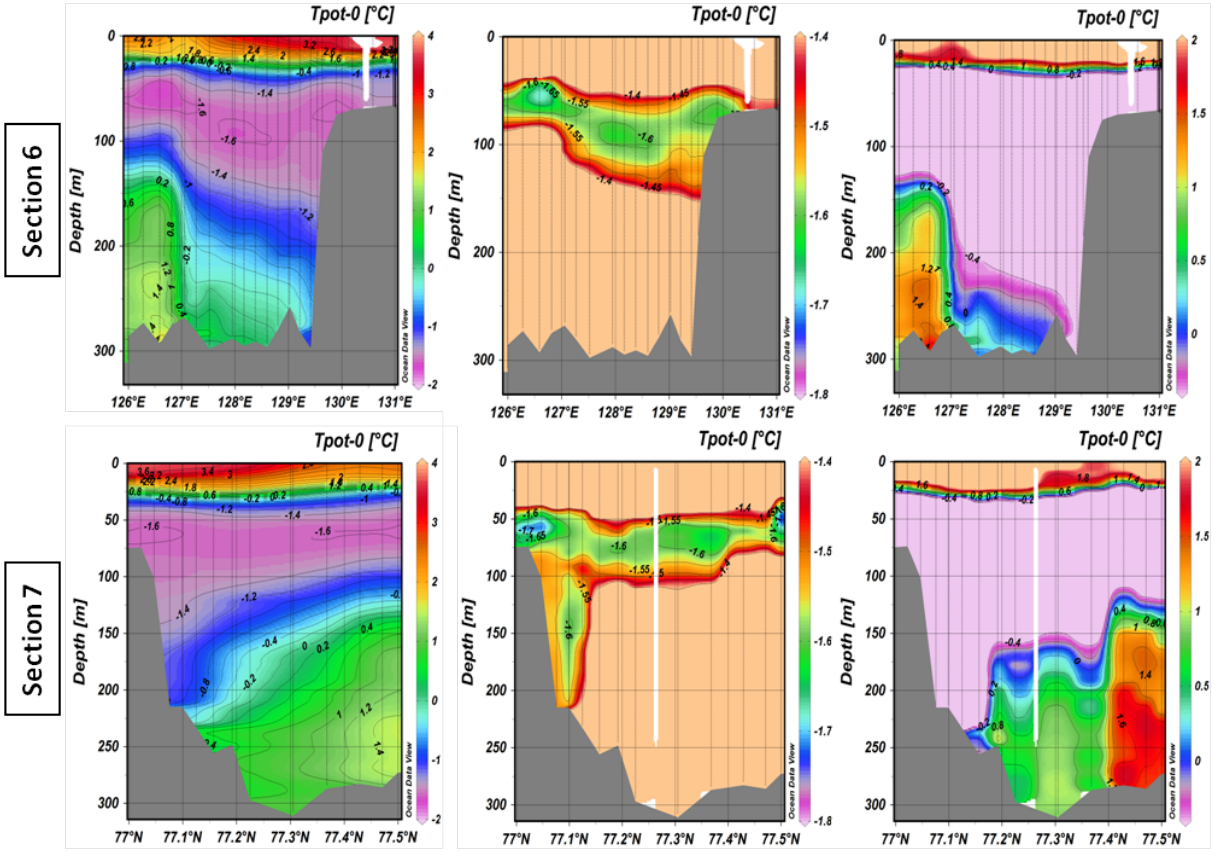


Fig. 28: Deep-water part of the vertical temperature and salinity distribution on transects 6 and 7 (left column). In order to describe the cold shelf waters, we plotted the vertical distribution of temperature in the range of -1.8 to -1.4°C (central column) and in order to describe the warm (above 0°C) Atlantic Waters, we plotted the vertical distribution of temperature in the range of -0.3 to 0.3°C (right column).

The plume of cold shelf waters on Transect 6 consisted of three water lenses, which extended in western direction, with a temperature below -1.6°C. They were ca. 30 m thick and their width varied from 19 to 30 km. On Transect 7, cold shelf waters with temperatures below -1.6°C extended from the shelf edge to the north at depths of 50 to 70 m with lenses of c. 25 m thickness. A patch of cold shelf waters with temperatures below -1.6°C and a salinity of 34.57 stretched from the shelf edge at a depth from 128 to 206 m over 5-10 km (Fig. 28, lower central diagram).

The Atlantic-Water frontal zone in this region differs from that on transects 1-3. The main Atlantic water mass on Transect 6 is located from the depth of 125-135 to the seafloor at a distance of 75 km from the shelf edge (Fig. 28, lower right diagram). The highest temperature of 1.77°C with a salinity of 34.85 was observed at the depth of 207 m. At the seafloor of the elevated part from 127°C toward the west, there was a layer of Atlantic Waters with a thickness of 30-40 m and a width of 45 km, which ended before the rising part of the seafloor at 129°E. In this area, temperature, salinity and density at the seafloor ranged from 0.13-0.37°C, 34.80-34.82 and 27,937-27,942 kg/m^3, respectively. The frontal zone of the Atlantic Waters on Transect 7 (Fig. 28, lower right diagram) was similar to that on Transect 6. The Atlantic Waters extended along the seafloor to the shelf edge over c. 10 km. The main mass of the Atlantic Waters with a thickness of 150 m, a maximum temperature of 1.77°C and a salinity of 34.85 was located at a distance of 40 km from the shelf edge.

Between the lower boundary of the cold shelf waters and the Atlantic Waters, there is a zone of interaction of these waters with temperatures from -1.5 to 0°C and salinities from 34.60 to 34.80.

Thermohaline conditions of the central and southern parts of the Laptev Sea

In the central part of the sea on Transect 4 (Fig. 29), water temperature at the surface ranged from 4.06-4.94°C and salinity from 19.44-25.67. Along the transect, we found two zones of increased temperature and decreased salinity. In the western zone with a width of 60 km in the area of 117°13'E-119°25'E, the temperature at the surface made up 4.51 to 4.77°C and salinity 19.44 to 21.80. We can assume that this western zone is related to the extension of the transformed waters of the Khatange River. The eastern zone extended from 125°15'E. In the area of our observations up to 126° (width of the zone was 22 km here), the highest temperature at the surface reached 4.89°C and the lowest salinity 19.90. At the end of the transect in the east, temperature and salinity at the surface made up 2.93-3.81°C and 8.15-15.16 over a distance of 66 km. This eastern zone is linked to the runoff of the Lena River. The decreased temperature at Bel'kovskii Island was probably due to a storm event on September 12, as a result of which the waters in the surface layer and in the layer below, which had a lower temperature, mixed.

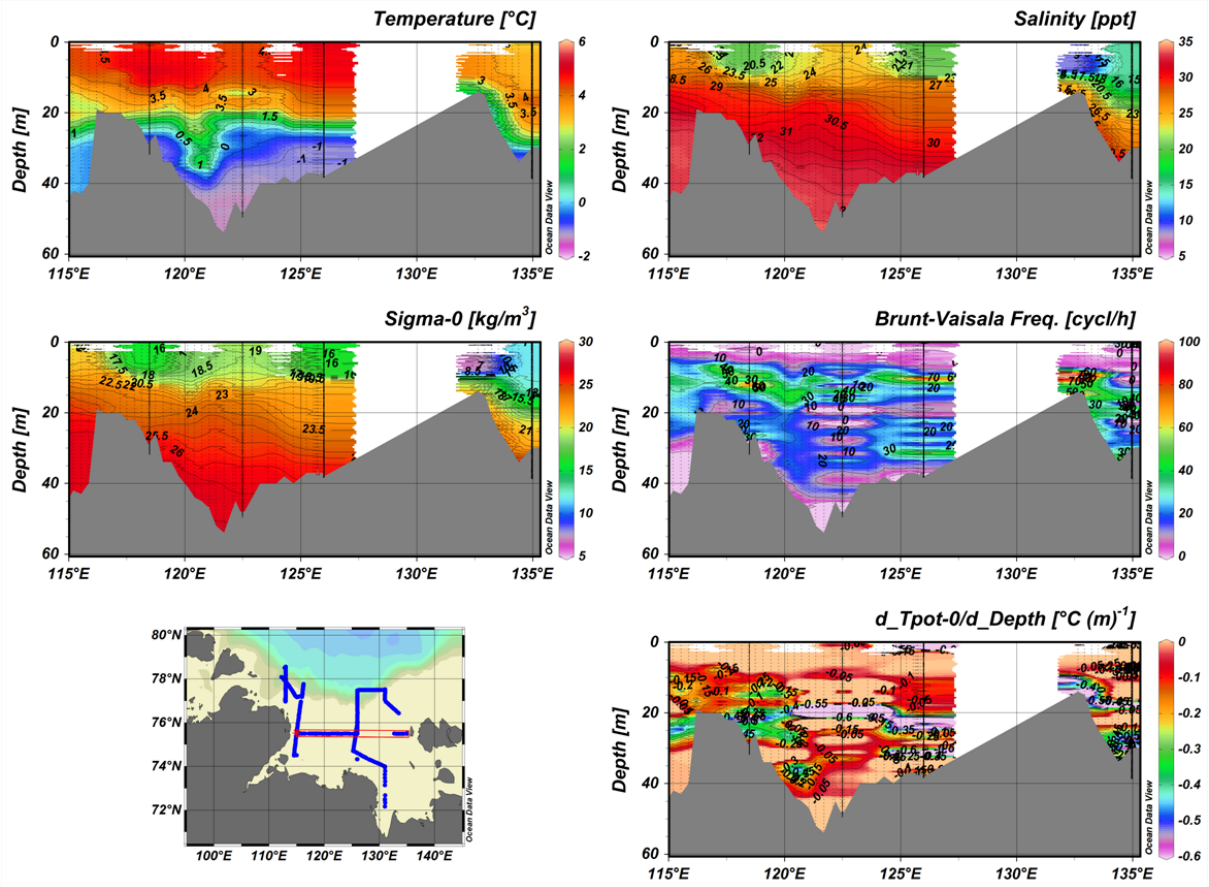


Fig. 29: Vertical distribution of temperature, salinity, density, Brunt-Väisälä frequency and vertical temperature gradient on Transect 4.

The thickness of the surface layer on Transect 4 made up 10-12 m with the exception of the eastern part where it increased to 15 m (Fig. 29, Brunt-Väisälä frequency [*cycl/h*]).

The distribution of the vertical temperature gradient (Fig. 29, Brunt-Väisälä frequency [*cycl/h*]) was of a patchy nature and it was difficult to determine a continuous boundary of the thermocline. Probably, processes of intensive vertical mixing and the formation of quasi-stationary conditions alternated repeatedly. The last cooling is reflected in the vertical temperature distribution in the surface layer. In the western and eastern zones of increased temperature at the depth of 7-10 m, the highest temperature was 4.73-5.12°C. These lenses of

warmer water at the beginning of fall "store" the heat from the previous summer period.

As we can see from the temperature plot in Figure 29, the isotherm shifts to greater depths, to 10 m, in the western part of the transect between 120°25'E and 121°31'E at the depth of 27-36 m and then rises again to its former depth level for 28 km. This vertical temperature structure is difficult to explain other than by an error of measurements.

In a dip of the seafloor, we find cold waters with a temperature of -1.30 to -1.32°C and a salinity of 33.67-33.82. This water was warmer and less saline than the cold shelf waters in the northern parts of transects 1-3.

In the southern part of the sea north of the Lena Delta on Transect 8, the temperature and salinity at the surface ranged from 3.42°C and 24.72 in the western part to 1.60-2.20°C and 18.21-13.48 at longitude 129°E over the elevated seafloor with a depth of 9 m (Fig. 30). With increasing depth, temperature slightly changed up to the seasonal thermocline, which was located at the depth of 18 m at the western stations. Then the thermocline shifted to a deeper level up to 25 m and in front of the elevation it was situated at the depth of 18 m. Below the thermocline the bottom waters had a temperature below 0°C, and at the seafloor at depths of 30-40 m, temperature and salinity ranged between -1.09 to -1.19°C and 32.68-32.98, respectively. On the eastern elevation at the depth of 22 m, temperature and salinity made up -0.18°C and 30.15 and on the eastern elevation at the depth of 9 m, they were 0.97°C and 24.31, respectively.

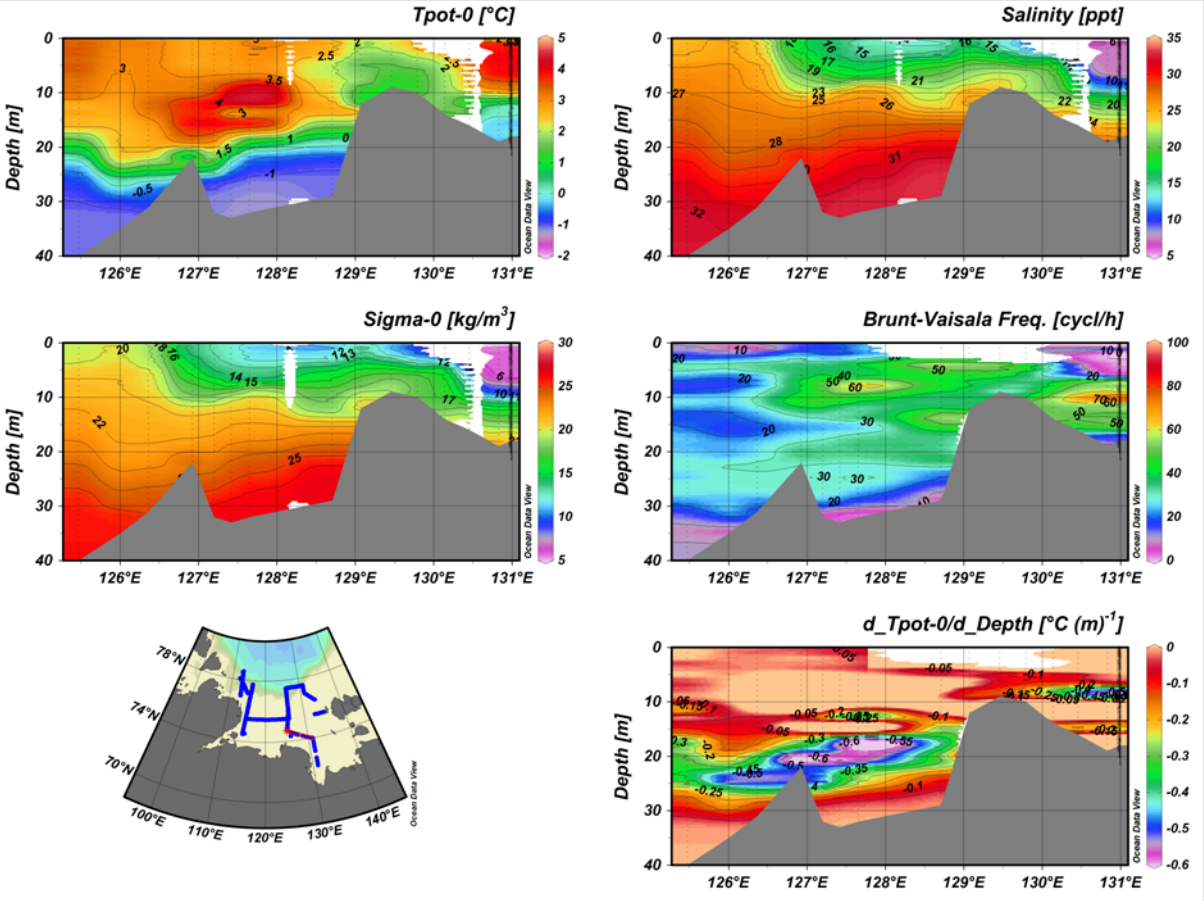


Fig. 30: Vertical distribution of temperature, salinity, density, Brunt-Väisälä frequency and vertical temperature gradient in the layer of 0-50 m on Transect 8.

East of the Lena Delta on Transect 9, temperature and salinity at the surface ranged from 2.88°C and 11.10 in the southern part of the transect to 3.87°C and 7.78 in its northern part (Fig. 31, upper row left, *Tpot_0[0°C]*). The thickness of the surface layer, associated with the

maximum density gradient, made up 8-10 m (Fig. 31, middle row, *d_Sigma_0/ depth[kg/m^3(m)$^{-1}$]*).

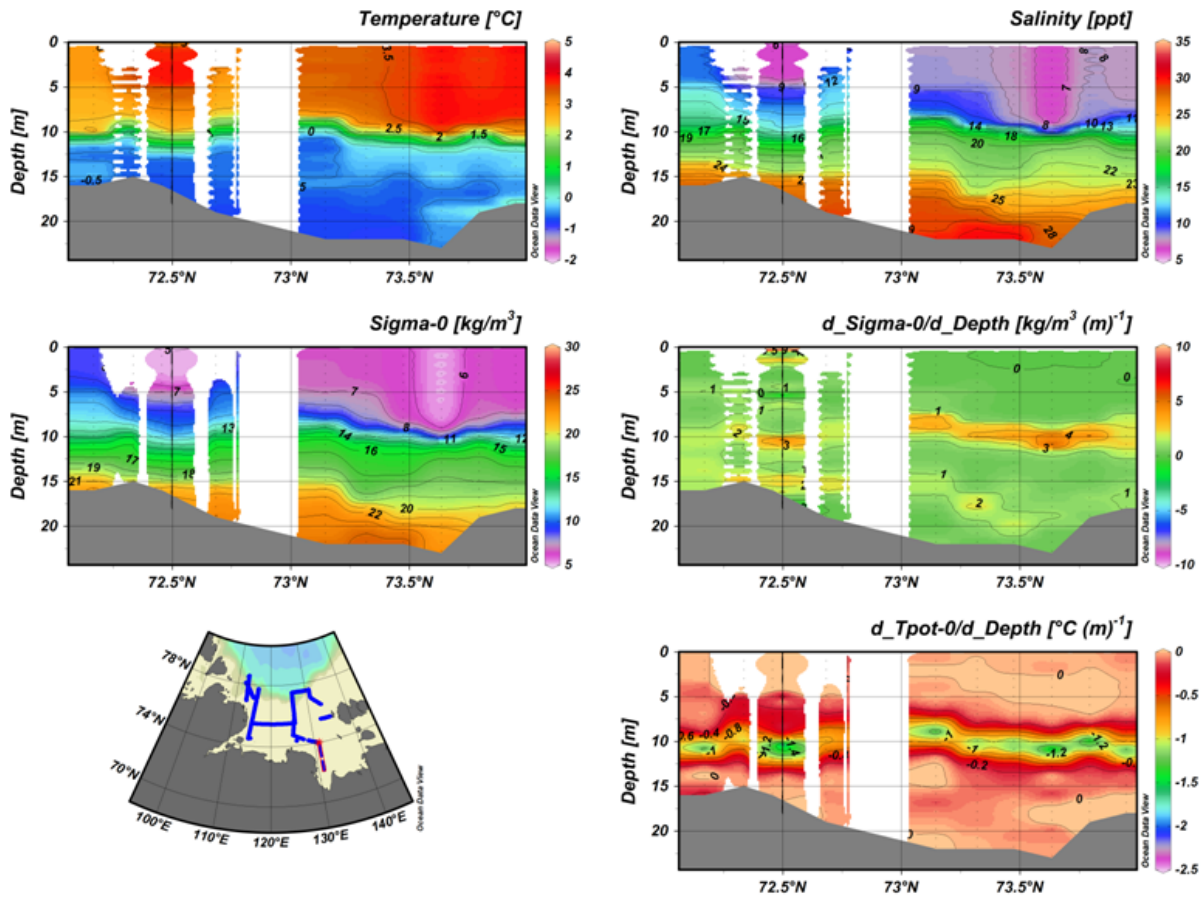


Fig. 31: Vertical distribution of temperature, salinity, density, Brunt-Väisälä frequency and vertical temperature gradient in the layer of 0-25 m on Transect 9.

The thermocline in this region coincided with the pycnocline and separated the surface layer from the cold bottom layer with temperatures below 0°C (Fig. 31, lower row right, *d_Tpot_0/depth[0°C (m)$^{-1}$]*). At the seafloor, temperature and salinity ranged from -0.07 to 0.09°C and 25.69-25.75 in the northern part of the transect at depths of 18-19 m to -0.76°C and 29.64 in the central part at depths of 19-22 m. At the southern station, temperature and salinity at the seafloor amounted to -0.58°C and 27.81, respectively.

Conclusions

Our oceanographic investigations with the use of state-of-the-art technology for measuring the water column with an Underway CTD (conductivity temperature depth meter) allowed us to obtain unique detailed information on the temperature and salinity distribution for a large area of the Laptev Sea.

The surface water temperature in the Laptev Sea in summer 2013 was everywhere higher than the mean long-term values. The highest anomalies were observed in the central part of the sea, where positive anomalies reached 3°C. Such high temperatures were the result of the influence of input of atmopsheric heat, which was anomalously strong in July and slightly less in August.

The salinity anomalies in the northwestern part of the Laptev Sea were positive anomalies, i. e., salinity in this region was slightly higher than the mean climatic values. This was related

to the input of more saline surface waters from the Arctic Basin into this region during July. In the southeastern part of the sea, salinity was lower than usual. The negative salinity anomalies reached values of 4. Therefore, in this region, we observed the most intensive freshening of surface waters.

The fact that we could more frequently take measurements of the water column allowed us to determine the conditions of the layer of cold shelf waters on the continental slope at the stage of its degradation. In the northwestern part of the sea, we found a large plume of saline and cold waters, which had formed on the shelf during winter. It originated mainly in the polynya area where cooling and salinization of the surface waters took place. These surface waters reached the seafloor as a result of winter convection. The atmospheric winter processes in January to May 2013 made an intensive formation of cold shelf waters on the shelf in the western part of the sea possible.

In the central and eastern parts of the sea, the formation of cold shelf waters was most likely less intensive. It must be noted that the phenomenon of the formation of such a considerable volume of cold and saline waters on the shelf has not been observed often. Therefore, the results of our expedition are particularly important for developing theories on the formation of cold waters on the shelf, on their flow over the shelf edge and on their distribution in the depth of the ocean from 50-70 m.

A major result of the expedition is that we obtained a detailed concept of the thermohaline structure in the area, influenced by the interaction of the Atlantic Waters with the shelf waters at the shelf edge. In the northwestern part of the sea, the Atlantic Waters with a layer thickness of 40-60 m reached depths of 160-190 m and the frontal zone of the Atlantic Waters was located 15-29 km from the shelf edge. Below the Atlantic Waters at the seafloor, we observed transformed waters with a low temperature.

The configuration of the frontal zone of the Atlantic Waters in the northeastern region differs from that on transects 1-3. The main mass of Atlantic Waters was found from the depth of 125-135m down to the seafloor at a distance of 40-75 km from the shelf edge. A thinner layer of Atlantic Waters extends along the seafloor toward the shelf edge at a distance of c. 10 km.

Hydrochemistry

E. Dobrotina, E. Chernyavskaya
Arctic and Antarctic Research Institute, St. Petersburg, Russia

Nutrients

Hydrochemical investigations are important for environmental monitoring. Dissolved oxygen is essential for the respiration of organisms. It accumulates in seawater due to photosynthesis and seawater/atmosphere exchange. It is then utilized for respiration and decomposition of organic matter. Nutrients (silicates, phosphates, nitrites, nitrates) form the mineral basis for primary production. Together with temperature and salinity, hydrochemical parameters provide evidence of the distribution of water masses and their temporal and spatial variability.

Sampling

During the expedition, water sampling for hydrochemical analysis was carried out at 20 stations in the Laptev Sea (Fig. 32). The sampling list of hydrocemical parameters is presented in Table 2.

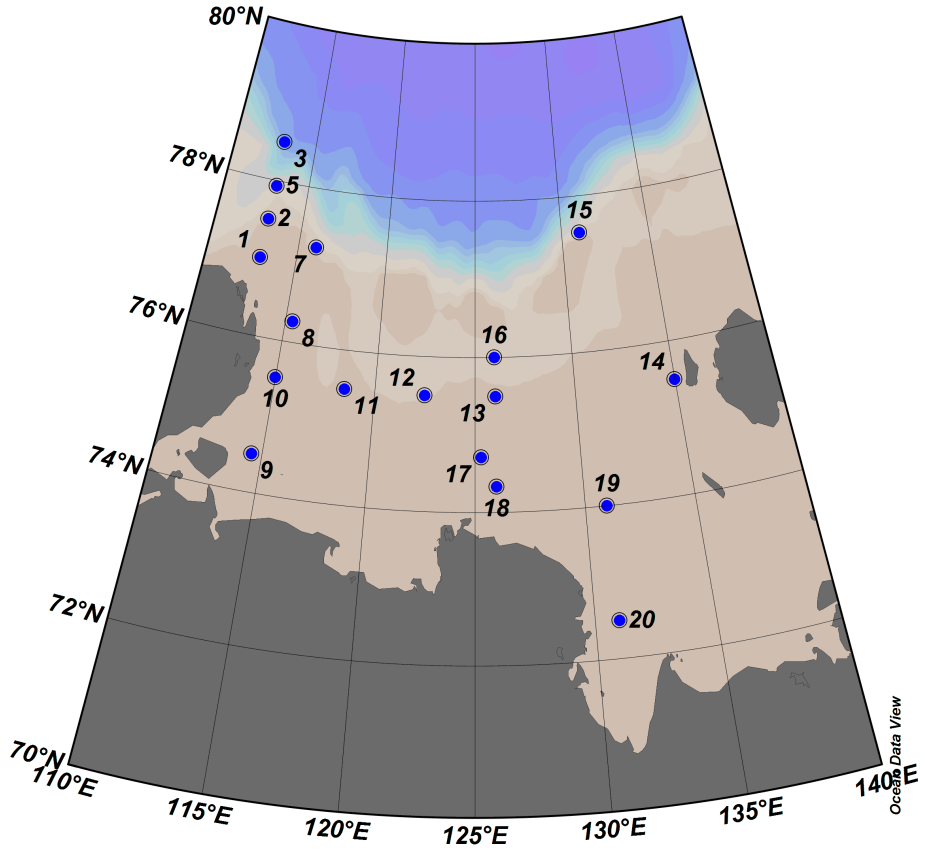


Fig. 32: Map of hydrochemical stations.

In total, 207 oxygen samples were collected and analyzed on board as well as 144 nutrient samples (phosphates and silicates). In addition, 207 nutrient samples were frozen for subsequent comparative analysis in the laboratory. Also, changes of the dissolved oxygen content in the water above the sediment samples during a few days of incubation were measured.

Table 2: Sampling list

Station name	Dissolved oxygen		Nutrients	
	Amount of samples	Sample depth	Amount of samples	Sample depth
VB1301	12	0, 2, 5, 10, 15, 20, 25, 30, 35, 40, 45, 48	12	0, 2, 5, 10, 15, 20, 25, 30, 35, 40, 45, 48
VB1302	12	0, 2, 5, 10, 15, 20, 25, 30, 40, 50, 55, 60	12	0, 2, 5, 10, 15, 20, 25, 30, 40, 50, 55, 60
VB1303-1	9	0, 100, 150, 200, 250, 300, 350, 370, 375	9	0, 100, 150, 200, 250, 300, 350, 370, 375
VB1303-2	5	5, 10, 20, 30, 45	5	5, 10, 20, 30, 45
VB1305-1	8	2, 5, 10, 15, 20, 25, 30, 50	8	2, 5, 10, 15, 20, 25, 30, 50
VB1305-3	6	75, 100, 150, 200, 250, 310	6	75, 100, 150, 200, 250, 310
VB1307-1	10	2, 5, 10, 15, 20, 25, 30, 40, 50, 55	10	2, 5, 10, 15, 20, 25, 30, 40, 50, 55
VB1308-1	9	0, 5, 10, 15, 20, 25, 30, 35, 38	9	0, 5, 10, 15, 20, 25, 30, 35, 38
VB1309-1	9	2, 5, 10, 15, 20, 25, 30, 35, 37	9	2, 5, 10, 15, 20, 25, 30, 35, 37
VB1310-1	10	2, 5, 10, 15, 20, 25, 30, 35, 40, 42	10	2, 5, 10, 15, 20, 25, 30, 35, 40, 42
VB1311-1	8	2, 5, 10, 15, 20, 25, 28, 30	8	2, 5, 10, 15, 20, 25, 28, 30
VB1312-1	10	2, 5, 10, 15, 20, 25, 30, 40, 45, 48	10	2, 5, 10, 15, 20, 25, 30, 40, 45, 48
VB1313	9	2, 5, 10, 15, 20, 25, 30, 35, 37	9	2, 5, 10, 15, 20, 25, 30, 35, 37
VB1314-1	9	2, 5, 10, 15, 20, 25, 30, 35, 37	9	2, 5, 10, 15, 20, 25, 30, 35, 37
VB1315-1	11	2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 65	11	2, 5, 10, 15, 20, 25, 30, 40, 50, 60, 65
VB1316-1	8	2, 5, 10, 15, 20, 25, 30, 40	8	2, 5, 10, 15, 20, 25, 30, 40
VB1316-2	9	2, 5, 10, 15, 20, 25, 30, 40, 45	9	2, 5, 10, 15, 20, 25, 30, 40, 45
VB1316-3	9	2, 5, 10, 15, 20, 25, 30, 40, 45	9	2, 5, 10, 15, 20, 25, 30, 40, 45
VB1316-11	9	2, 5, 10, 15, 20, 25, 30, 40, 45	9	2, 5, 10, 15, 20, 25, 30, 40, 45
VB1316-12	9	2, 5, 10, 15, 20, 25, 30, 40, 45	9	2, 5, 10, 15, 20, 25, 30, 40, 45
VB1317-1	8	2, 5, 10, 15, 20, 25, 30, 40	8	2, 5, 10, 15, 20, 25, 30, 40
VB1318-1	7	2, 5, 10, 15, 20, 25, 30	7	2, 5, 10, 15, 20, 25, 30
VB1319-1	6	2, 5, 10, 15, 17, 20	6	2, 5, 10, 15, 17, 20
VB1320-1	4	2, 5, 10, 15	4	2, 5, 10, 15

Water sampling was carried out with an SBE 32SC rosette equipped with twelve Niskin bottles (2.5 l each), an SBE 19plus CTD sensor and an AFM module. Sampling was carried out on standard levels, which are for the Laptev Sea Shelf 0 m (surface, 0-2 m), 5 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m and the level which is as close as possible to the bottom.

Hydrochemical sampling and analysis aboard the research vessel VIKTOR BUYNITSKIY were carried out by E. Dobrotina and E. Chernyavskaya.

Methods

Samples for determining DO (dissolved oxygen) were taken out first. Water was sampled into precalibrated glass bottles of ~100 ml. After sampling, oxygen was fixed by sequential adding

of 1 ml of manganese chloride solution and 1 ml of potassium iodide/sodium hydroxide solution. The sample was mixed until an evenly distributed precipitate formed. This precipitate was dissolved by adding 2 ml of sulfuric acid. The dissolved oxygen content was determined by titration with sodium thiosulphate using an automatic burette ABU-80 following the modified Winkler method (Bulk Concentration of Dissolved Oxygen …, 2010).

Every 7 days the working solution of sodium thiosulfate was calibrated using certified standards of iodate (Bulk Concentration of Dissolved Oxygen …, 2010). To test the reproducibility, replicate samples were analyzed periodically. Inaccuracy was less than 0.01 ml / l O_2.

Nutrient samples were collected in dark plastic bottles of 500 ml. Each bottle had been washed three times with seawater from the corresponding Niskin bottle before sampling. In the ship's laboratory, 20 ml of each sample were put into two Nessler cylinders (one for phosphates and one for silicates). After adding a properly mixed reagent and a reducer to each cylinder, the samples kept for 2 hours. After stable coloration was obtained, the optical density of the solutions, which is proportional to the concentration of dissolved phosphates/ silicates, was measured using a photocolorimeter KFK-3 (Bulk Concentration of Phosphates …, 2010; Bulk Concentration of of Silicon …, 2010). The accuracy of the analyses was tested throughout the cruise using standard solutions prepared from State Standard Samples (GSO).

Water samples for nutrients were also collected in 60-ml plastic bottles. Immediately after sampling the bottles were frozen at temperatures below -18°C and in this state, later transported to the OSL laboratory for further analysis, which will be conducted using a nutrient autoanalyzer SKALAR Sun + + System.

Preliminary results

The available data allow analyzing hydrochemical conditions of the Laptev Sea on two transects (latitudinal and meridional) in the western part of the sea. For these transects the vertical distributions of dissolved oxygen, oxygen saturation (Figs. 33, 35), phosphates and silicates (Figs. 34, 36) were plotted.

According to the data of the transects, the spatial distribution of the phosphates is characterized by high values of this parameter west of the Lena Delta. An area of low values is located in a submarine canyon of the Khatanga River in the western part of the sea. In general, however, the phosphate values increased with depth.

Increasing values of dissolved silicates at the bottom at the depth of 40 m north and northeast of the Lena Delta (Fig. 36), where the values similar to those obtained for the mixed layer, can be explained by resuspension of fine-dispersed particles containing silicon in the shallow part of the sea. This is evidenced by higher values of turbidity on the same depth levels in the same part of the area (turbidity was measured with a turbidity sensor). At the same time, silicate content decreases with distance from the Lena Delta to the west and north.

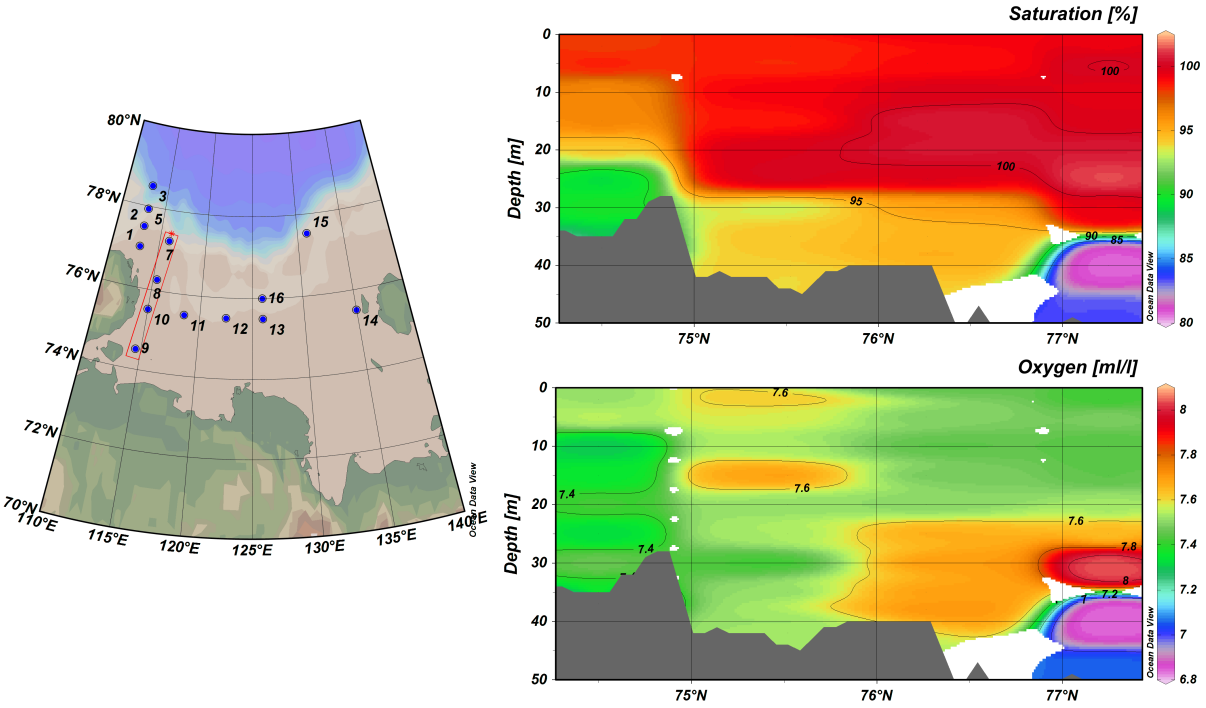


Fig. 33: Vertical distribution of oxygen saturation and dissolved oxygen along a meridional transect (stations 7, 8, 9, and 10) in September 2013.

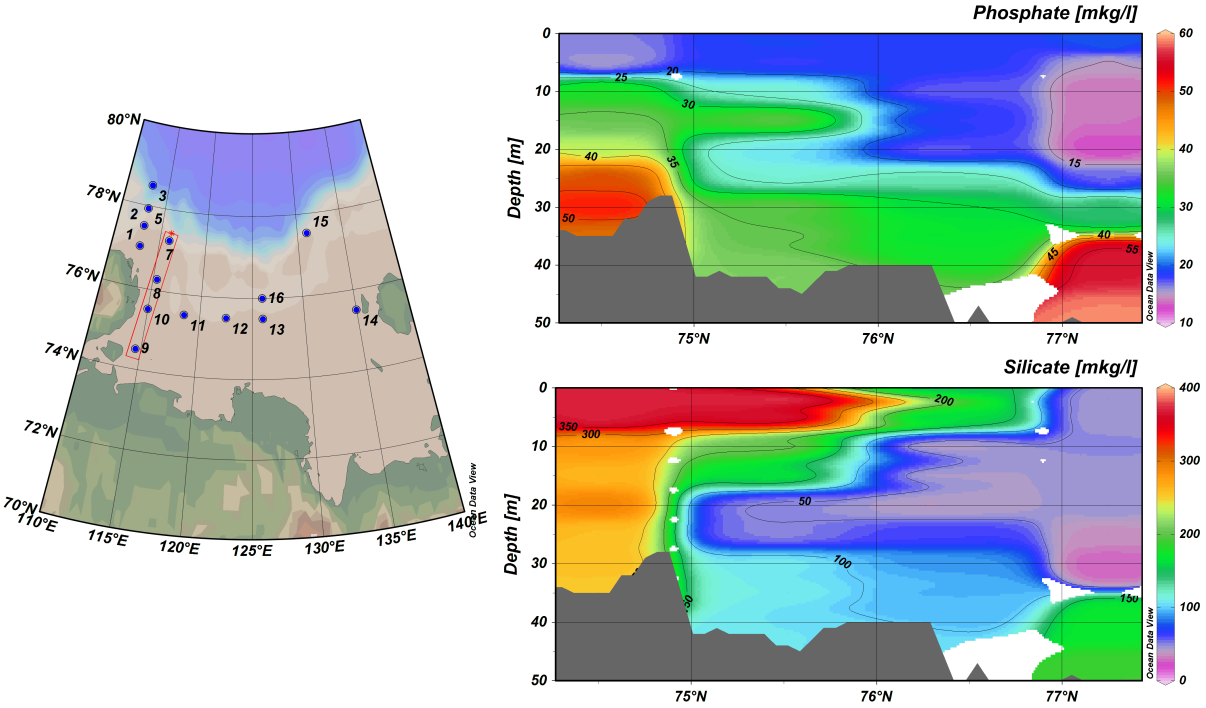


Fig. 34: Vertical distribution of phosphates and silicates along a meridional transect (stations 7, 8, 9, and 10) in September 2013.

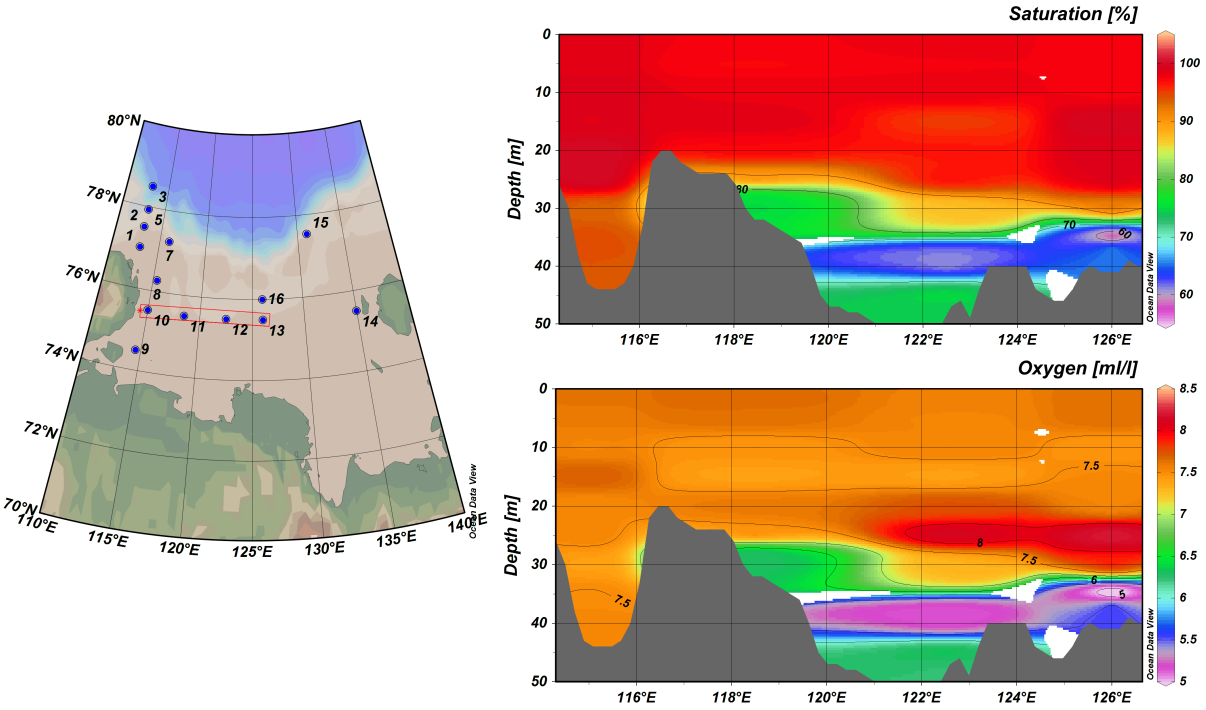


Fig. 35: Vertical distribution of oxygen saturation and dissolved oxygen along a latitudinal transect (stations 10, 11, 12 and 13) in September 2013.

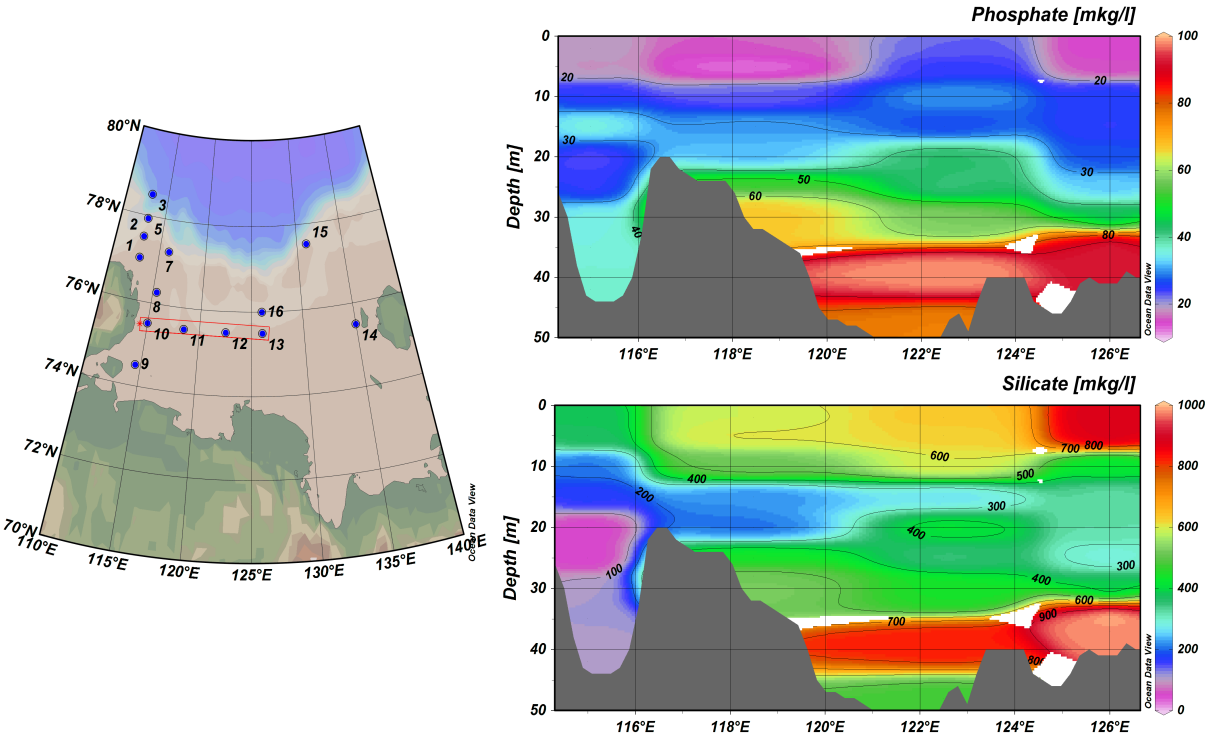


Fig. 36: Vertical distribution of phosphates and silicates along a latitudinal transect (stations 10, 11, 12 and 13) in September 2013.

In the upper layer at the depth of 2-5 m, dissolved-oxygen concentration was highest in the southeastern part of the Laptev Sea (more than 8.0 ml/l) (Fig. 37). In the same area the highest values phytoplankton fluorescence (more than 55 units ftu) were detected at the same depth (fluorescence was measured with a fluorometer). Therefore, it can be concluded that the high

concentrations of dissolved oxygen in this region were the result of phytoplankton activity.

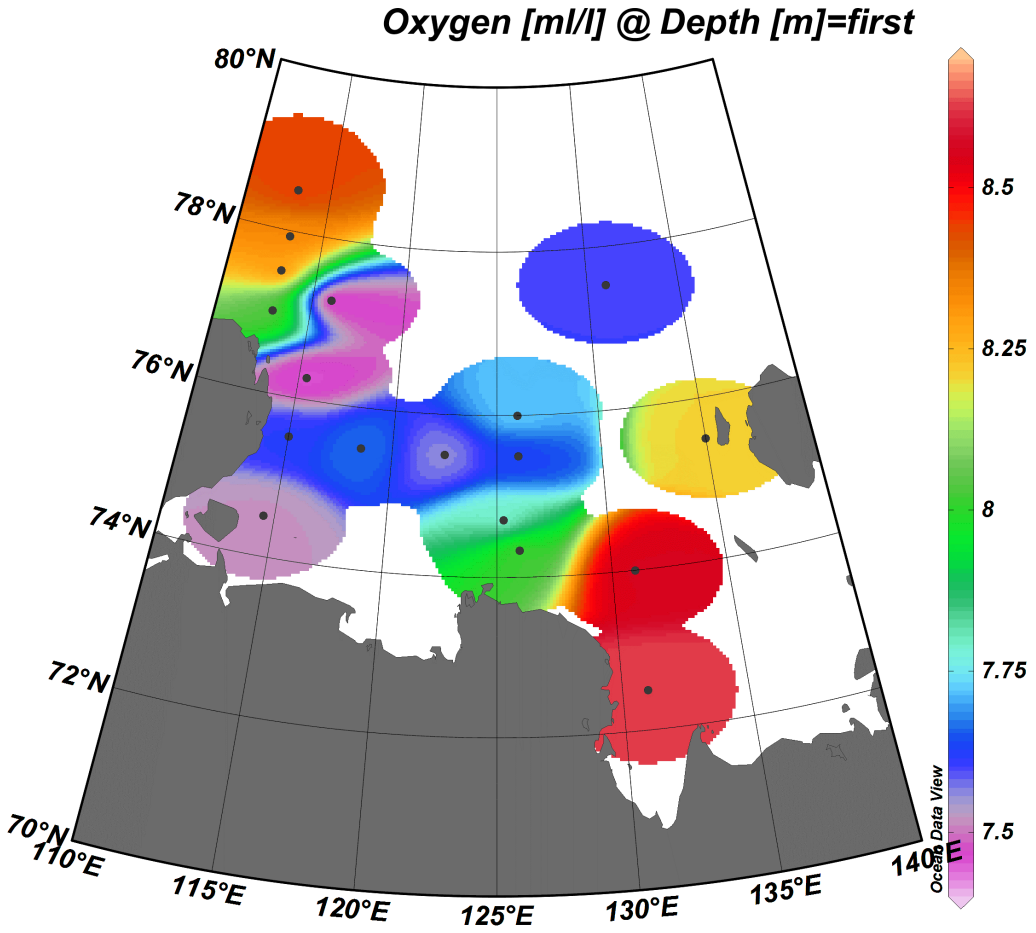


Fig. 37: Spatial distribution of dissolved oxygen in the upper 2-to-5-m layer in September 2013.

The area of maximum dissolved-oxygen values was also observed in the northwest of the sea. High concentrations of about 8.0 ml/l were observed from the sea surface down to the seafloor. Maximum oxygen saturation of seawater with peaks at 15-25 m (over 105%) was also noted in the whole water column in this region. This can be explained by the low water temperatures that were measured in the part of the Laptev Sea mentioned above.

In the bottom layer of the shallow part of the Laptev Sea (at depths up to 50 m), there was a significant decrease of dissolved oxygen concentration to 5-6 ml/l (minimal values of 3.3 ml/l). At the same time, dissolved-oxygen saturation values amounted to 60-80% (minimum 40%). Such values indicate the presence of stagnant waters near the seafloor (Fig. 35).

Conclusion

In total, during the expedition period, nutrient concentration varied in the following ranges:

- phosphates: 0.1-1.07 mmol/l (values increased with depth, the maximum concentrations were found in the eastern part of the continental slope of the Laptev Sea);
- silicates: from 0.44 to 35.5 mmol/l (maximum values were observed in the section along 75°N (Fig. 36)).

Dissolved-oxygen concentration in the surface layer varied from 7.3 to 9.0 ml/l, and its saturation values from 93 to 110%. Along the latitudinal transect, oxygen saturation values and dissolved-oxygen concentration decreased with depth (about 50% and less than 5 ml/l,

respectively) due to their absorption by the oxidation of organic substances under the conditions of weak vertical mixing (stagnant waters).

The results obtained are generally in line with archival data on the structure of the surface and the vertical distribution of dissolved oxygen and nutrients in the study area. There is a similarity of profiles and of the range of concentrations.

References

Bulk Concentration of Dissolved Oxygen in Seawater. Technique for Measuring With the Iodometric Method (2010) Guidance document 52.10.736-2010 RD, Moscow: Roshydromet (in Russian).

Bulk Concentration of Phosphates in Marine Waters. Technique for Measuring With the Photometric Method (2010) Guidance document 52.10.738-2010 RD, Moscow: Roshydromet (in Russian).

Bulk concentration of Silicon in Seawater. Technique for Measuring With the Photometric Method With a Blue Molybdeum-Silicic Acid (2010) Guidance document 52.10.744-2010 RD, Moscow: Roshydromet (in Russian).

WATER MASS PROXIES – NEODYMIUM ISOTOPES AND REE CONCENTRATIONS OF SEAWATER AND SURFACE SEDIMENTS

G. Laukert
GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany

Objectives

The Laptev Sea is characterized by intensive river-runoff, sea-ice production and sea-ice transport into the Arctic Ocean. Studying the lateral and vertical water-mass distribution and matter transport within this area deepens our understanding of these processes and their variability and changes through time.

Neodymium behaves independently of any fractionation processes in the oceans and its residence time is in the order of or shorter than the average circulation time of the global ocean, thus making it a reliable tracer of water masses. Hydrothermal input and continental weather regimes can also be studied using combined neodymium isotope ratios and neodymium and rare-earth-element (REE) concentrations.

In the Laptev Sea, input from distinct freshwater sources such as the Siberian rivers or melting sea ice can be traced and quantified using combined neodymium and REE data. Also of particular interest is the water and particulate-matter input via the Vilkitsky Strait, which connects the Kara and the Laptev seas. Additionally, neodymium and REE fluxes between water and surface sediment can be studied to investigate boundary exchange processes on the Siberian shelfs.

Methods and equipment

Thirty water samples with a volume of more than 11 l each and sixteen surface sediment samples were collected during TRANSDRIFT XXI for neodymium and REE analyses (Fig. 38). The water samples were collected from fifteen stations using 2.5-l Niskin bottles attached to a CTD rosette. Surface water (upper 3-7 m of the water column) and water close to the seafloor was sampled at every station with the exception of the shallow Station 20, where only surface water was taken (water depth was ~16 m). At Station 3, an additional intermediate water sample was taken at 190 m, where temperature was slightly higher, indicating the influence of the Atlantic water layer. All water samples were collected in 10-l acid-cleaned plastic canisters (and additionally acid-cleaned 0.250-l plastic bottles) and immediately filtered through AcroPak^{TM} Capsules with Supor® Membrane (pore size: 0.8/0.45 µm) to avoid exchange of dissolved Nd/REE and Nd/REE in the suspended particles. The samples were transported to the OSL.

The sediment samples were collected with a multicorer (uppermost and bottom part of each core) and freeze-dried at the OSL. Further treatment will take place at GEOMAR.

Preliminary results

The samples were acidified to pH ~2.2 using distilled concentrated HCl. For each sample, a filtered aliquot of 500 ml was separated for the measurement of Nd and REE concentrations. 50 mg of iron was added to the 10-l samples in the form of previously purified dissolved Fe-chloride. After allowing 24 h for equilibration, ammonia solution (25%, Merck-suprapure®) was added to increase the pH up to 8 inducing co-precipitation of the dissolved Nd with the iron oxyhydroxides. After the precipitate had settled at the bottom of the canisters, the supernatant was discarded and the residue was transferred into 1-l acid-cleaned plastic bottles

for transport to GEOMAR, where the samples will be analyzed.

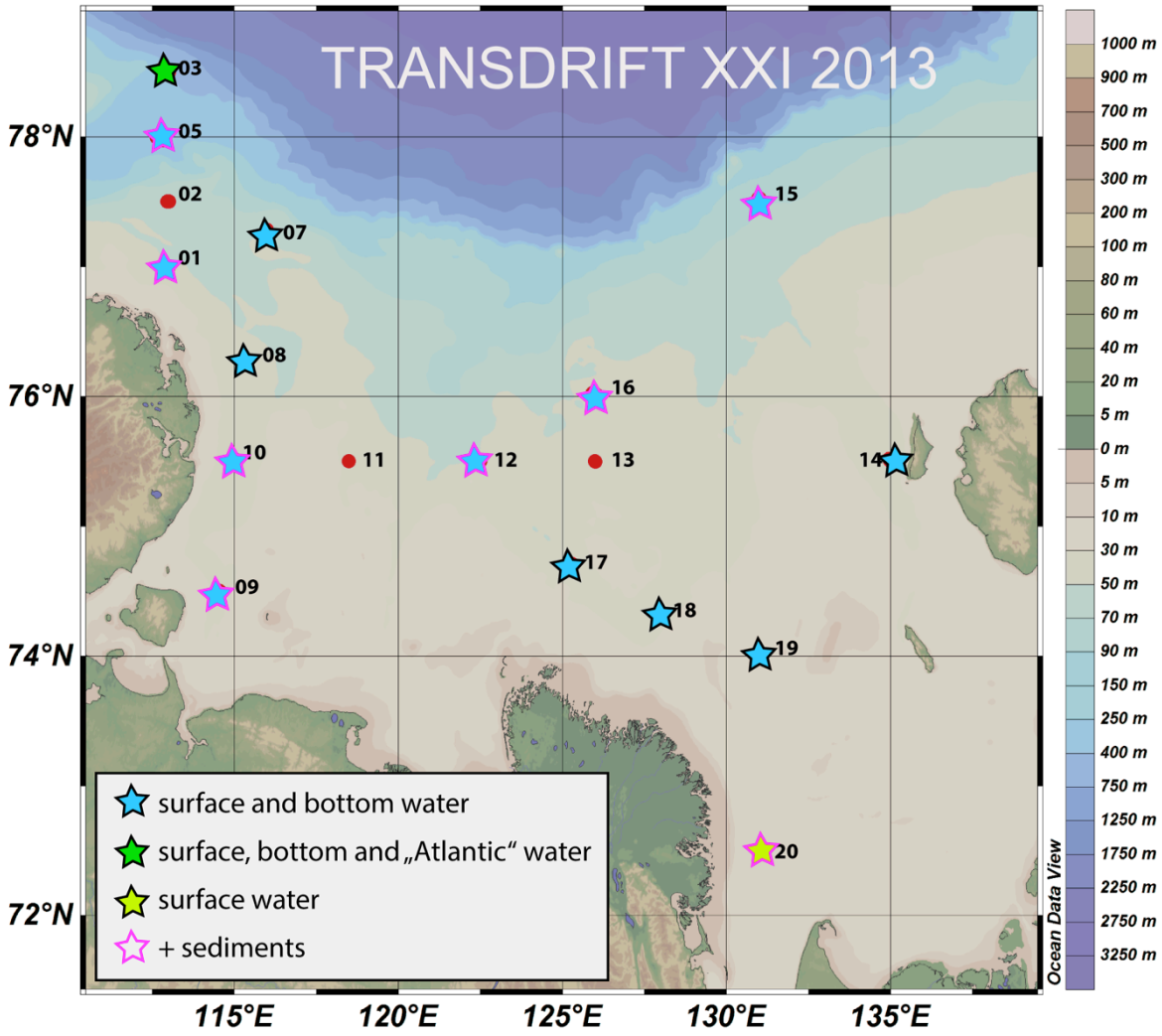


Fig. 38: Map showing water and sediment sampling locations for neodymium and REE analyses.

CHROMOPHORIC DISSOLVED ORGANIC MATTER

J. Hölemann[1], F. Martynov[2,3]
[1]Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Bremerhaven, Germany
[2]St. Petersburg State University, St. Petersburg, Russia
[3]Arctic and Antarctic Research Institute / Otto Schmidt Laboratory for Polar and Marine Research, St. Petersburg, Russia

Chromophoric dissolved organic matter (CDOM) exists in all natural waters. Its source is the degradation of plant material of both terrestrial and aquatic origin. In coastal waters it occurs in large quantities due to runoff from rivers and it is responsible for a major part of the attenuation of photosynthetically available radiation (PAR). CDOM's light adsorption properties can result in both a positive and a negative feedback on aquatic organisms. In surface layers harmful UV light is attenuated, while deeper in the water column light is limited (Stedmon & Markager, 2001). Thus, CDOM can play a substantial role in the biogeochemistry of natural waters merely through its influence on the aquatic light field (for a review see Blough & Del Vecchio, 2002). The runoff from the Lena to the Laptev Sea is characterized by high concentrations of CDOM. Based on results of recent studies, we assume that riverine CDOM mixes conservatively with seawater. During the TRANSDRIFT XXI expedition, we collected CDOM data. With these we will test this hypothesis, and determine if the CDOM concentration in the Laptev Sea can be used as a tracer for the spatial distribution, transport , and mixing processes of river water on the Laptev Sea shelf. The determination of the CDOM concentration in water samples was supplemented by in-situ CDOM-fluorescence measurements parallel to all CTD casts.

Methods and equipment

Sampling was carried out on several stations across the Laptev Sea shelf (Fig. 39). Water samples were taken from different water depths, filtered on board, and analyzed immediately after the expedition at the OSL.

Approximately 300 ml of seawater was filled in a pre-cleaned (with seawater from the same water sampler) bottles. Immediately after sampling the seawater was vacuum-filtered (with 250 ml NALGENE filtration set at approximately 400 mbar) through a Whatman GF/F glass microfiber filter (4.7 cm diameter) with a nominal pore size of approximately 0.7 µm. The filter was pre-washed with ~20 ml Milli-Q water and approximately 20 ml of the seawater sample. After washing the filter, 250 ml of seawater was filtered. 50 ml of the filtrate was used to rinse the storage bottles. The rest of the filtrate (200 ml) was filled into two storage bottles and stored in a dark and cold place. The filter was air dried and packed in aluminum foil. The CDOM analysis will be carried out with a SPECORD 200 spectrophotometer at the OSL in St. Petersburg.

In-situ measurements of the fluorescence of dissolved organic matter were carried out at all water sampling stations with a pumped flow-through fluorometer (Wetstar from Wetlabs, ex/em: 370/460 nm), which was attached to a Seabird 19+ CTD.

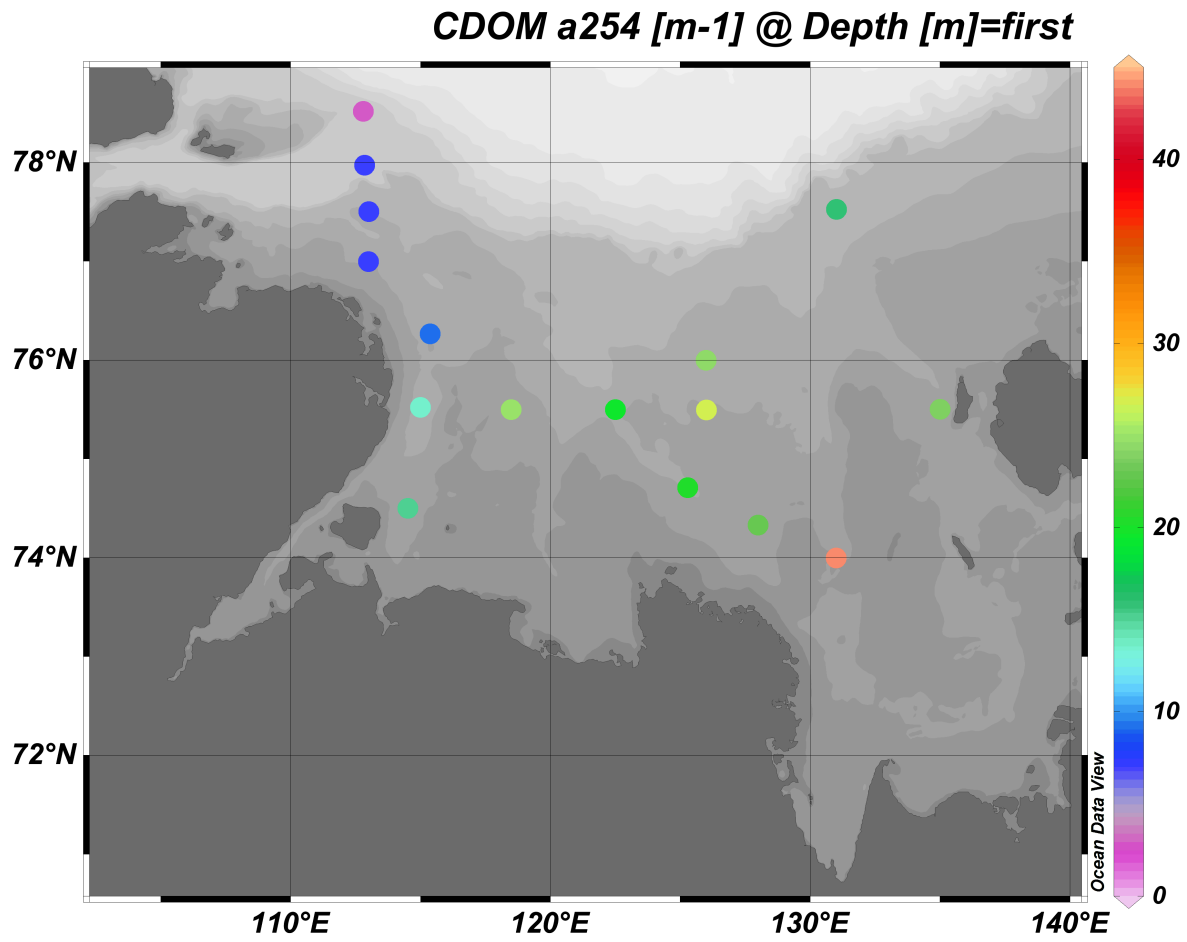


Fig. 39: All stations where CDOM samples were taken. The colored dots show the light-absorption coefficient (m^{-1} – at a wavelength of 254 nm) in the surface mixed layer. High values indicate high concentrations of CDOM of terrestrial origin.

First results

In September 2013, the shelf of the Laptev Sea east of 127°E and south of 76°30'N was characterized by low salinities (<20) and high CDOM concentration in the surface mixed layer (Fig. 39). The first results of the CDOM analysis show a nearly conservative mixing between the CDOM-rich freshwater from the Lena River and the CDOM-poor water masses from the Arctic Basin (salinity >34) (Fig. 40). Only the samples which were taken in the surface mixed layer near the coast and close to the ice edge show an absorbance coefficient (and fluorescence) to salinity ratio that is below this mixing line, i. e. they exhibit a lower CDOM concentration than typical shelf waters of the same salinity. This indicates an additional freshwater input from melting sea ice and smaller streams, which have a significantly lower CDOM concentration than the water from the Lena River. This emphasizes the use of CDOM to distinguish between different water masses on the Laptev Sea shelf which possess the same salinity but are of different origins.

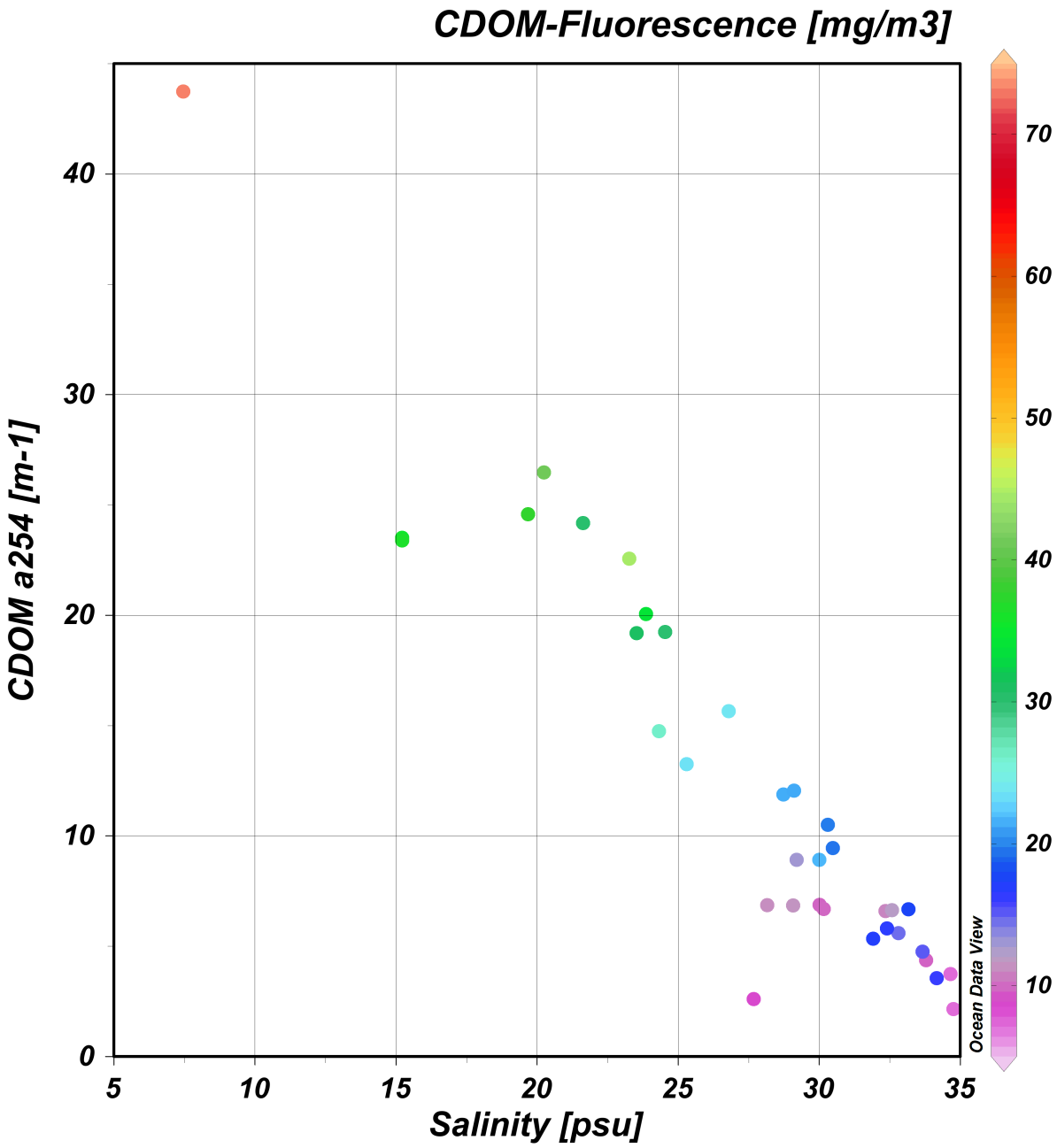


Fig. 40: Variation of the light absorbance coefficient (@ 254 nm) and fluorescence of dissolved organic matter (color bar) with salinity.

References

Stedmon C.A., Markanger S. (2001) The optics of chromophoric dissolved organic matter (CDOM) in the Greenland Sea: an algorithm for differentiation between marine and terrestrial derived organic matter. Limnology and Oceanography, 46(8): pp. 2087-2093.

TRACER OCEANOGRAPHY – STABLE OXYGEN ISOTOPES

B. Thibodeau
Mainz Academy of Sciences, Literature and Humanities, Mainz, Germany

Methods

Our working program is carried out on the basis of the oxygen isotope composition ($\delta^{18}O$) of the water in conjunction with hydrological data. River water in the Arctic is highly depleted in $\delta^{18}O$ relative to marine waters. The effect of sea-ice melting or formation on the water column can be separated from these two sources since sea-ice processes strongly influence salinity whereas the $\delta^{18}O$ signal remains nearly unaltered. On this basis winter brine production can be quantitatively evaluated based on $\delta^{18}O$ and salinity summer data (e. g., Bauch et al., 2009a, 2009b).

The most abundant oxygen isotope is ^{16}O. Further stable oxygen isotopes are ^{17}O and ^{18}O. The natural abundance is ^{16}O=99.76%, ^{17}O=0.04% and ^{18}O=0.2%.

For analysis the ratio of ^{18}O /^{16}O (R) is measured and given as the permille deviation relative to a standard. In the case of ocean water, this is the sea water standard SMOW (standard mean ocean water):

$$\delta^{18}O\text{ -sample}=(R\text{ sample}/R\text{ standard}-1)x1000.$$

Since ^{18}O is slightly heavier, a water molecule with $H_2{}^{18}O$ will behave slightly different, e. g., it will evaporate less easily than its lighter counterpart but it will condense more easily than $H_2{}^{16}O$. Therefore, there are isotopically different water masses. Most pronounced is the isotopic composition of river water (fed by evaporation and successive precipitation) with a $\delta^{18}O$ value for the Lena River of about -20. Atlantic Water on the other hand has a $\delta^{18}O$ value of about 0.4.

Since $\delta^{18}O$ is measured on the oxygen of the H_2O itself, it is not a trace element and its conservation is relatively easy. No poisoning of the water is necessary. And a short gas-exchange (bubbling while sampling) is of no harm. The only important thing is to prevent the samples from evaporating. The $\delta^{18}O$ samples, therefore, were stored (and sampled) in glass bottles because the evaporation through plastic containers is too intense.

TRANSDRIFT XXI expedition

We gathered samples at all of the CTD/rosette stations visited during the expedition down to the bottom (in order to capture bottom layers or bottom currents). Sampling depth were 0 m, 5 m, 10 m, 15 m, 20 m, 25 m, 30 m, 40 m, 50 m … bottom depth). Sampling at the lowest depth was done as close to the seafloor as possible. We sampled at more depth levels when the station was located in deeper waters.

Also, we attached a Remote Access Sampler (RAS-100) to a seafloor observatory (1893). The RAS-100 is programmed to take a sample (100 ml) every week for 48 weeks. This will be used to investigate the dynamics of the water masses throughout the year at this single location, which should be located under pack ice or close to the polynya. The total amount of water samples was 178. 48 supplementary samples will be taken by the RAS-100 during 2013-2014.

Preliminary results

The water samples are in transit to Germany and thus no results are available yet. The

samples from the RAS-100 will be recovered during the TRANSDRIFT XXII expedition in 2014 and will be analyzed in 2015.

References

Bauch, D., Dmitrenko, I.A., Kirillov, S.A., Wegner, C., Hoelemann, J., Pivovarov, S., Timokhov, L.A., Kassens, H. (2009a) Eurasian Arctic shelf hydrography: exchange and residence time of southern Laptev Sea waters. Continental Shelf Research, 29: pp. 1815-1820.

Bauch, D., Dmitrenko, I.A., Wegner, C., Hoelemann, J., Kirillov, S.A., Timokhov, L.A., Kassens, H. (2009b) Exchange of Laptev Sea and Arctic halocline waters in response to atmospheric forcing. Journal of Geophysical Research, 114: pp. C05008, doi:10.1029/2008JC005062.

SUSPENDED PARTICULATE MATTER

B. Juhls, C. Wegner
GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany

Goals and objectives

The Arctic summer sea-ice cover is continuously decreasing as a result of climate change, accelerating in the record minima in September 2007 and 2012. Larger open water areas due to reduced sea-ice cover on the vast Siberian continental shelves in summer are expected to lead to increased resuspension of bottom sediments and coastal erosion due to larger wind fetch and wave heights. Additionally, annual Arctic river discharge may increase by 10-20% under a doubled CO_2 scenario, accompanied by increased input of freshwater as well as suspended and dissolved matter to the Arctic ecosystem. The export of turbid waters from rivers and coastal regions together with increased sediment resuspension on the shelf influence not only the distribution of REE and Nd-isotopes in the inflow and surface-outflow area of the Transpolar Drift Stream but also the primary productivity. Altered biogeochemical cycling and increased turbidity could either enhance the delivery of nutrients to microalgal populations or impair photosynthesis by scattering and absorbing sunlight. A detailed understanding of the pathways of suspended particulate matter (SPM), therefore, is critical in order to draw the connection between sediment dynamics, optical properties and ecosystem dynamics under a changing climate. During the TRANSDRIFT XXI expedition, we carried out process studies on the distribution and dynamics of suspended particulate matter (SPM) in the inflow and surface-outflow area of the Transpolar Drift Stream in the western and eastern Laptev Sea, respectively, as well as on the transport dynamics in the mid-shelf area. In addition, seafloor observatories for long-term studies were deployed.

Methods and equipment

To investigate the vertical and horizontal distribution of SPM as well as their dynamics within the inflow and surface outflow area of the Transpolar Drift Stream in the western and eastern Laptev Sea, direct (water samples) and indirect measurements (turbidity meter) were carried out to determine the SPM concentration in the water column. A Seapoint Turbidity Meter connected to a CTD (SBE19plus, Seabird, USA) was used in order to collect water column turbidity, salinity, and temperature measurements at 20 stations. The turbidity meter emits light of 880 nm wavelength with a constant output time of 0.1 sec. It detects light scattered by particles within the water column and generates an output voltage proportional to particles in the water column. The output is given in Formazine Turbidity Unit (FTU), a calibration unit based on formazine as a reference suspension.

Throughout the cruise, 170 water samples at 18 stations of 0.5/1 l each were collected at defined water depths (0 m, 5 m, 10 m, 15 m, 20 m … above the seafloor and bottom sample) to obtain the SPM concentrations by using traditional filtering and weighing procedures and to calibrate the optical backscatter. The water samples were filtered through pre-weighed HVLP filters (MILLIPORE Durapore membrane filters, Ø 0.45 microns). The turbidity measurements will be correlated with corresponding *in situ* water samples to obtain accuracy by taking the effects of different mineralogy, varying particle darkness, and salinity of ambient water on the response of the turbidity meter into account. The water samples and turbidity meter measurements in the vicinity of the one-year mooring stations will be used to verify the mooring data (turbidity meter and ADCP measurements – Acoustic Doppler Current Profiler; see below). The SPM data will be compared to the CDOM data to further

improve the estimates of satellite derived ocean color measurements. Additionally they will be examined in combination with nutrient data, with Nd-samples to derive the origin of the SPM and with chlorophyll-*α* samples to determine the algal component.

To study the seasonal variability of SPM dynamics in the inflow and surface-outflow area of the Transpolar Drift Stream in the western and eastern Laptev Sea, respectively, as well as the transport dynamics in the mid-shelf area, seafloor observatories were deployed for one year (western part: VILKITSKY and TAYMYR; eastern part: KOTELNYY; mid-shelf: 1893). For the SPM studies, the moorings were equipped with turbidity meters at different water depths and upwards- and downwards-looking ADCPs. The turbidity meters will determine the optical backscatter for a certain water depth. They are equipped with Bio Wipers to prevent biofouling. The intensity of the backscattered acoustic signal (echo intensity) of the ADCPs provides information on particle concentration in the entire water column. The echo-intensity data will be used in combination with turbidity measurements, CTD and current data to estimate horizontal and vertical SPM fluxes.

First results

The turbidity and silicate concentrations within the entire water column in the inflow and surface-outflow area of the Transpolar Drift Stream in the western and eastern Laptev Sea are significantly different (Fig. 41): in the western Laptev Sea turbidity and silicate concentration are considerably lower (up to 6 times) in the surface and bottom layer compared to the eastern Laptev Sea, which is influenced by the Lena River outflow. However, in the western Laptev Sea an increase in turbidity at the water depth of 15-25 m was found, which might be related either to a phytoplankton bloom or to an increased SPM transport.

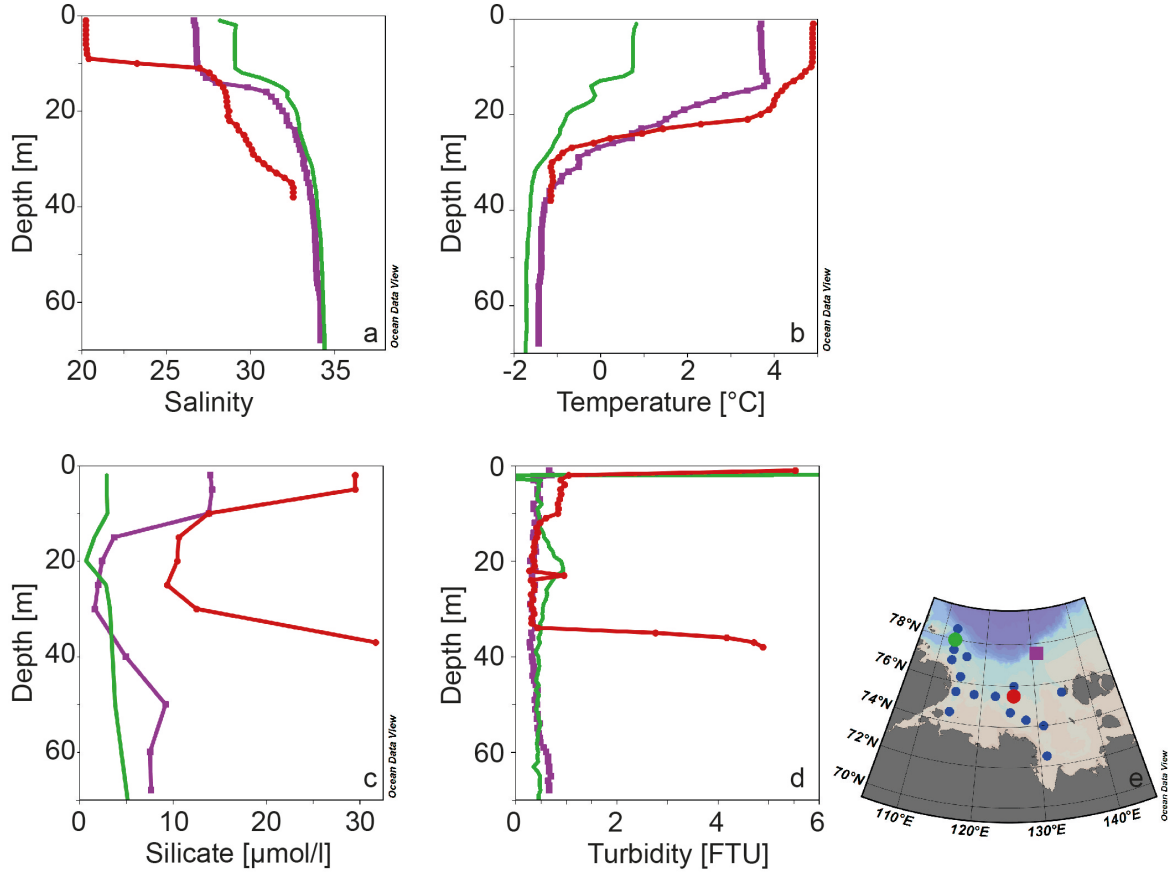


Fig. 41: (a) Salinity, (b) temperature [°C], (c) silicate concentration [µmol/l], and (d) turbidity [FTU] within the entire water column in the inflow (green) and surface-outflow area (purple) of the Transpolar Drift Stream and on the mid-shelf (red) during TRANSDRIFT XXI (station map (e)).

BIOLOGICAL INVESTIGATIONS: ZOOPLANKTON

E. Abramova[1], F. Martynov[2,3], I. Kryukova[4,5]
[1]Lena Delta Nature Reserve, Tiksi, Sakha Republic, Russia
[2]St. Petersburg State University, St. Petersburg, Russia
[3]Arctic and Antarctic Research Institute / Otto Schmidt Laboratory for Polar and Marine Research, St. Petersburg, Russia
[4]Moscow State University, Moscow, Russia
[5]Institute of Water Problems, Russian Academy of Sciences, Moscow, Russia

The main aim of zooplankton investigations during the TRANSDRIFT XXI expedition was to collect comparative data on the spatial distribution of the species composition, abundance and biomass of phytoplankton and zooplankton, as well as chlorophyll-*a* concentrations in different parts of the Laptev Sea shelf to find out to what extent they depend on the salinity and temperature conditions, water stratification and nutrient concentration.

Eighteen biological stations located on several transects were occupied in summer 2013 (Fig. 42). The positions of these stations allow us to estimate the influence of different environmental parameters on pelagic community structure. The freshwater discharge of several Siberian rivers and its strong seasonal variability create clearly pronounced east-west and south-north gradients of hydrological and hydrochemical conditions and control the distribution and volume of primary and secondary production in the pelagic community on the Laptev Sea shelf. Analysis of the data obtained during the TRANSDRIFT XXI cruise (August-September 2013) will improve our understanding of the interrelation of the hydrological regime with the pelagic ecosystem structure and functioning in the Arctic regions.

Zooplankton sampling and sample processing

Zooplankton samples were collected using two different nets: a WP2 net (mouth diameter 57 cm, mesh size 100 µ, cone length 260 cm) with closing system and a quantitative Apstein net (mouth diameter 17 cm, mesh size 100 µ, cone length 100 cm). Sampling was carried out at eighteen stations located along five transects. Transect I crosses the entire shelf from west to east (stations 10, 11, 12, 13, 14). The other four short transects are orientated from south to north: Transect II (stations 1, 2, 5, 3) and Transect III (stations 9, 10, 8, 7) are located in the western part of the Laptev See shelf, and Transect IV (stations 18, 17, 13, 16) and Transect V (stations 20, 19, 14, 15) in the eastern area of the shelf (Fig. 42).

Two samples (under and above the pycnocline) were taken at each station during the TRANSDRIFT XXI expedition with the WP2 net. We obtained a total of 55 zooplankton samples including 20 samples from the 24-h station 16 (Fig. 42) where the net casts (every 10-12 m) were repeated five times with a periodicity of about four hours. In addition 16 total zooplankton samples (from bottom to surface) were collected with an Apstein net for DNA analysis of the *Calanus* species, inhabiting the Laptev Sea shelf. The nets were washed using a seawater pump after every cast and the samples were poured into a plastic bucket (Fig. 43). On board, the samples were gently concentrated and immediately preserved in 4% borax-buffered formalin or in 95% ethanol. Male and female Copepodite stages V-VI of *Calanus* sp. were sorted for DNA analysis from alcohol-preserved samples. The ethanol in these samples was changed several times (every 24 hours).

After the expedition, some of the formalin-preserved samples were processed in a Bogorov Chamber under a binocular microscope Olympus SZX9 or Olympus BX60 in the OSL and under a stereomicroscope MSP-2 in the Institute of Environmental Geosciences of the Russian Academy of Sciences (St. Petersburg). In accordance with traditional methods, almost all

adult organisms were determined to species level. Juvenile copepods were separated into copepodite stages and identified to species/genus level. Cephalothorax length was used to distinguish the stages IV-VI of *Calanus finmarchicus* and *C. glacialis*, as well as *Pseudocalanus major* and *P. acuspes*. For the very abundant Copepoda of the Clausocalanidae, such as *Drepanopus bungei* and *Pseudocalanus* spp., with morphologically similar naupliar stages, the latter were attributed to the species of that family whose adults were dominant in each sample. Otherwise, nauplii were counted without species identification. Zooplankton abundance (ind./m^3) and biomass (mg/m^3) were calculated for species, different age stages, principal taxa and total organisms in each sample.

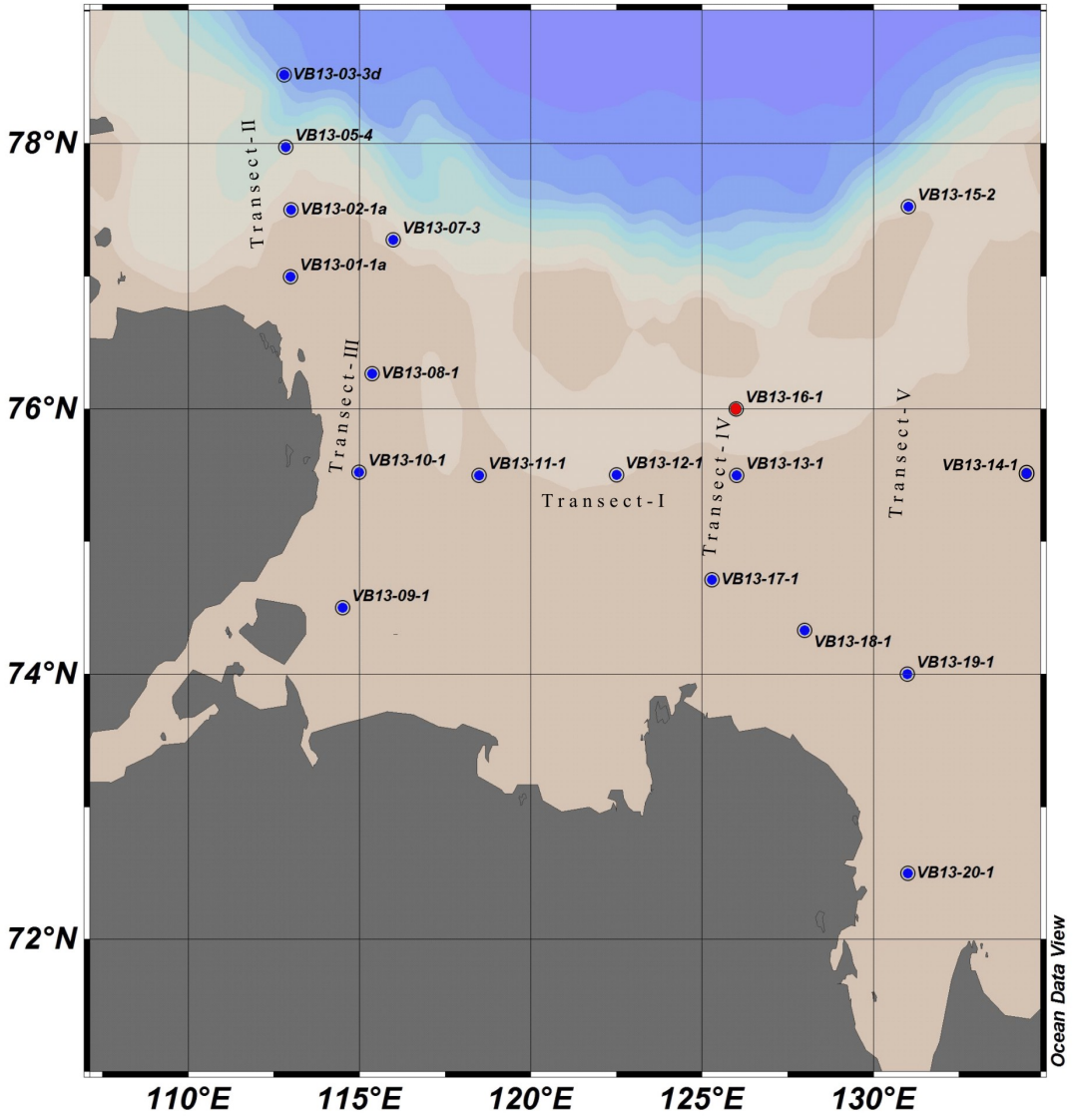


Fig. 42: Biological stations and positions of the transects, carried out during the TRANSDRIFT XXI expedition.

Material and methods

Chlorophyll *a* sampling and samples processing

Two hundred water samples were obtained at eighteen stations for analyzing concentration and horizontal/vertical distribution of chlorophyll *a* on the Laptev Sea shelf during the expedition aboard VIKTOR BUYNITSKIY. 44 water samples among them were obtained

from the 24-h station 16.

Fig. 43: Collection of zooplankton samples aboard RV VIKTOR BUYNITSKIY.

Half a liter of water was taken from the carousel water sampler at standard water depths (2 m, 5 m, 10 m, 15 m… and near the seafloor). It was poured into plastic bottles. After that, the water samples were filtered through Whatman GF/F filters (pores: 0.7 microns) with pressure of not more than 0.2 bar in the laboratory onboard the ship. For preservation, the filters were put in Eppendorf tubes, signed with station and depth, and frozen in a freezer at a temperature not above -20ºC.

Further processing of the samples, especially measuring the amount of chlorophyll in the filters, took place at the OSL. The pigments were extracted from the concentrated algal sample in an aqueous solution of acetone. The chlorophyll *a* concentration is determined spectrophotometrically with a fluorometer TD Trilogy and a spectrophotometer SPECORD 200 by measuring the absorbance (optical density, OD) of the extract at various wavelengths. The resulting absorbance measurements are then applied to a standard equation.

Phytoplankton sampling and sample processing

During the TRANSDRIFT XXI cruise, sampling for the phytoplankton study was carried out

at 16 stations. A total of 116 water samples and 28 net samples were collected.

For the quantitative analysis, water samples of 1 l were collected with a rosette sampler equipped with 2.5-l Niskin bottles. Sampling was conducted at defined water depths (2 m, 5 m, 10 m, 15 m… and near the seafloor). Immediately after sampling, the algae were fixed with 4% neutralized formalin. In the laboratory, the processing method will include filtration of the water samples through nuclear pore filters (pore size 1 micron) with pressure of not more than 0.2 bar. After that the filters will be stored in plastic bottles with 4% neutralized formalin for further microscopic examination.

For the qualitative analysis sampling was conducted with an Apstein net (Hydro-Bios, mesh size 20 µm, diameter 20 cm). At each station a net was towed through the water column twice: from the bottom to the surface layer and from the pycnocline to the surface layer. Samples were preserved with 4% neutralized formalin and stored until they will be analyzed at a land-based laboratory.

Microscopic examination of all samples will be carried out at the Laboratory of Pleistocene Paleogeography (Lomonosov Moscow State University) and the OSL. Counting and identifying phytoplankton will be performed using a standard (non-inverted) light microscope (Zeiss Axiovert; Olympus) at 200× and 400× magnification in a 0.05 ml Nageotte Chamber. For species that will not be identified with light microscopy, a scanning electron microscope will be used (Shirshov Institute of Oceanology, Moscow). Cell counts will be converted to cell concentration as described by Radchenko et al. (2010). Phytoplankton biomass will be estimated using taxon-specific carbon values (Menden-Deuer & Lessard, 2000) and the biovolume of algae calculated from the volumes of appropriate stereometrical bodies (Hillebrand et al., 1999).

Statistical analyses will be performed using PRIMER, version 5.2.4. (Clarke & Warwick, 2001). The similarity of phytoplankton at different stations will be calculated from the relative contributions of the algae to total biomass. A similarity matrix for species data will be compiled employing the Bray-Curtis index. Patterns in the ordination of samples will be explored by non-metric multi-dimensional scaling (MDS) (Clarke & Warwick, 2001).

The Shannon-Wiener diversity index will be used to analyze species diversity.

The relationship between the phytoplankton community and environmental factors (salinity, temperature, nutrients) will be analyzed by canonical correlation analysis (CCA) using Canoco for Windows 4.0 soft.

Preliminary results and conclusions

Chlorophyll *a* distribution

Chlorophyll *a*, a characteristic algal pigment, constitutes approximately 1% to 2% (dry weight) of planktic algal biomass. This feature makes chlorophyll *a* a convenient indicator of algal biomass and the level of primary production. During the TRANSDRIFT XXI expedition, we obtained data on the main patterns of distribution of chlorophyll *a* values in the Laptev Sea during the period of maximum open water in the first half of September.

Our data demonstrate that the summer concentrations of chlorophyll *a* were generally low on the Laptev sea shelf and confined to the uppermost layer in September 2013. The heat and matter supply, originating from the rivers during spring and summer, shapes the phytoplankton distribution and plays a significant role in phytoplankton development. This is a reason for the fact that the highest chlorophyll-*a* concentrations in the upper 5-10 m were found exactly in the areas close to the rivers (Khatanga, Lena) with low salinity due to river-water influence (Figs. 44, 45). The chlorophyll *a* values in that case reached 2.0-2.5 mg/m^3.

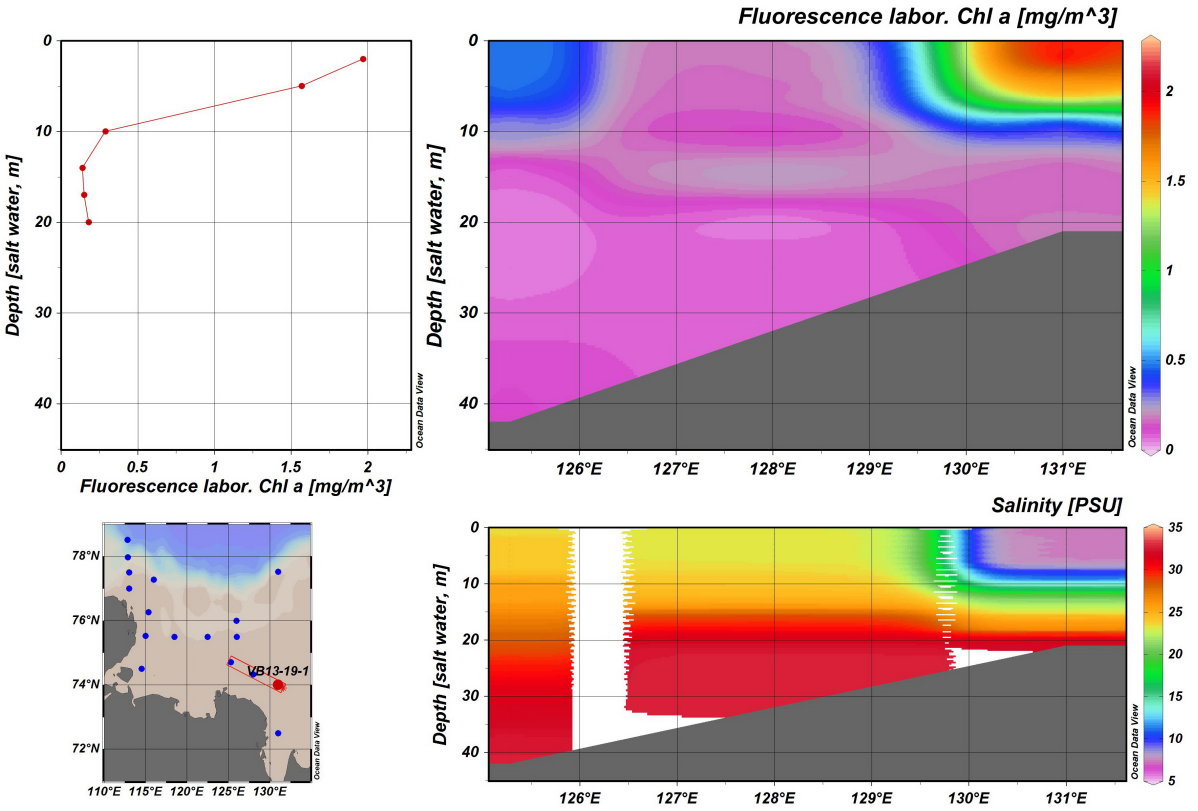


Fig. 44: Transect along the Lena Delta with a distinct peak of chlorophyll *a* in the upper 5 m (upper right panel) and salinity distribution (lower right panel). Vertical distribution of cholorphyll *a* at station VB12_19 (upper left panel).

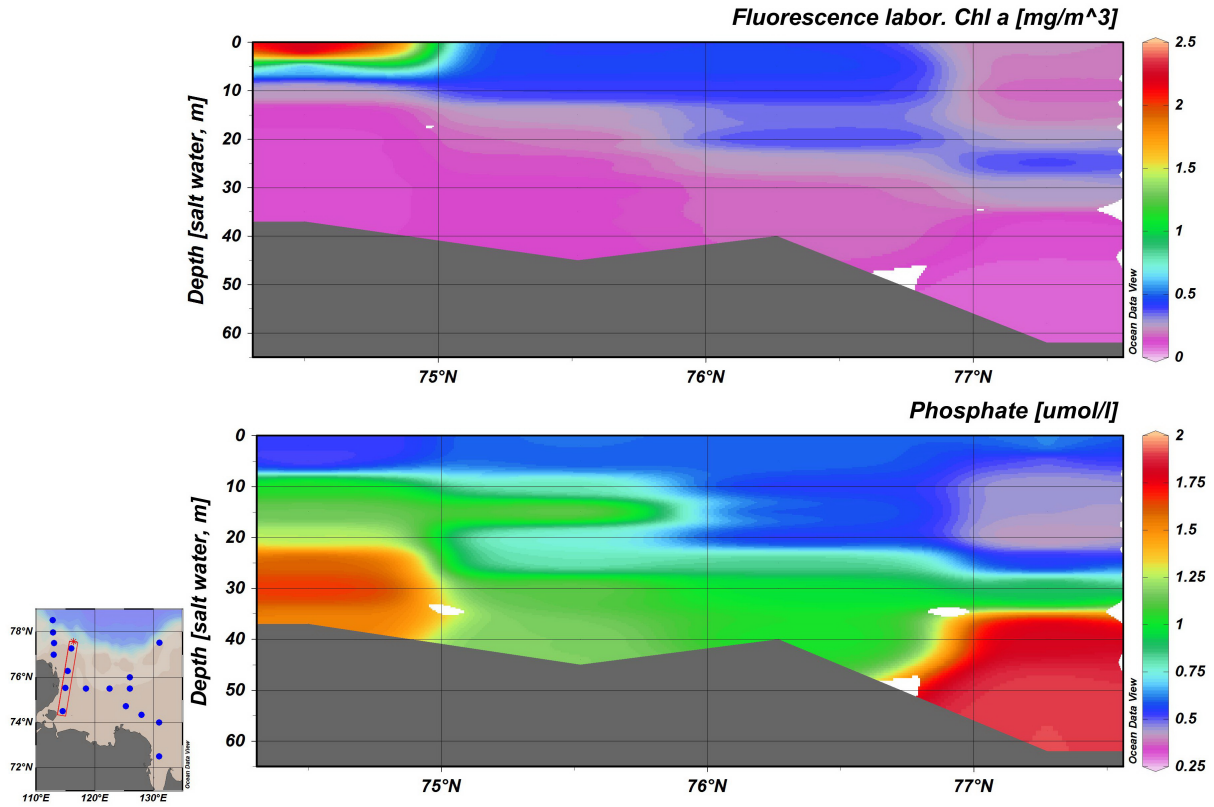


Fig. 45: Transect along 115°N with a distinct peak of chlorophyll-*a* concentrations in the upper 5 m close to Khatanga mouth (upper panel) and phosphate distribution (lower panel).

In the other regions of the Laptev Sea shelf, the average total amount of chlorophyll *a* in the top 10 m of the water column was similar and very low (on average 0.5 mg/m^3), while the vertical distribution was quite different. In different parts of the Laptev Sea, deep subsurface chlorophyll maxima are often observed. They significantly contribute to primary production. Commonly these subsurface pigment maxima were found in or just below the pycnocline. It is well known that Arctic seas are characterized by a pronounced salinity-temperature stratification due to the thaw-freeze cycle of sea ice and large amounts of freshwater input. The analysis of data from the previous summer and winter TRANSDRIFT expeditions shows that, for the pre-bloom (March) and spring bloom (April-May), as well as for comparatively high surface Chlorophyll-*a* concentration throughout the open water period, the chlorophyll-*a* maximum is mainly located at or near the surface. The deep-sea chlorophyll-*a* maximum takes place chiefly during the post-bloom period (September) when the surface chlorophyll-*a* concentration is generally low (0-0.5 mg/m^3) on the Laptev Sea shelf.

In summer 2013, the deep-sea chlorophyll maximum was observed at the stations VB13_03 and VB13_05 in the northwestern part of the Laptev Sea (Fig 46). The maximum value (5.0 mg/m^3) was recorded at the station VB13_05 at the depth of 20 m. The same pattern was observed at the station VB13_03 but with values of 1.0 mg/m^3. All other parts of the Laptev Sea showed low concentration of the chlorophyll *a* pigment in the water column, with the medium value rare exceeding 0.3 mg/m^3.

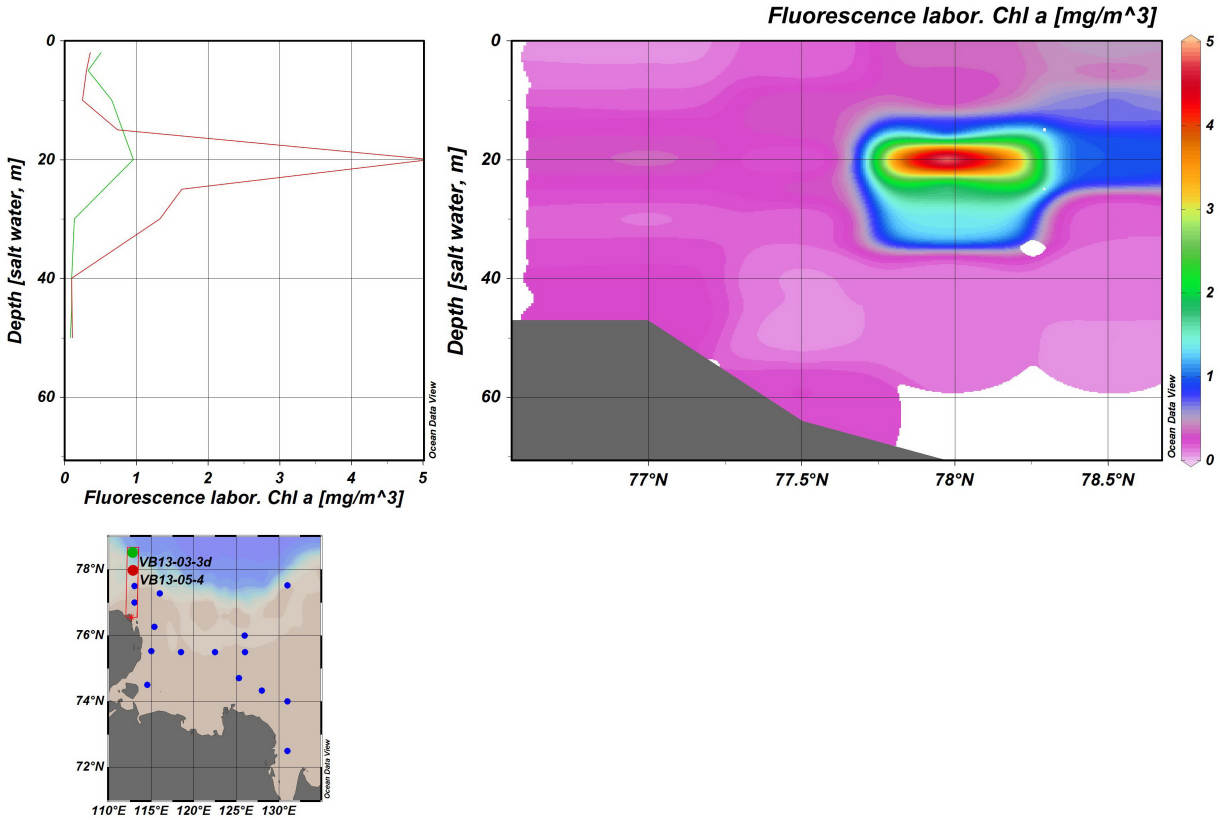


Fig. 46: Vertical distribution of the chlorophyll-*a* values at the stations VB13_03 and VB13_05 (left) and transect close to Vilkitsky Strait with the distinct peak of chlorophyll-*a* concentrations at the depth of 20 m (right).

All of the above leads to the conclusion that the herbivorous food web is well established on the Laptev Sea shelf during the summer months (June-August) when many young herbivorous and opportunistic copepods mostly concentrate in the surface layer and strongly influence the phytoplankton and chlorophyll-*a* concentration in this layer in September.

Zooplankton sample processing

In September 2013, zooplankton was found to be represented by 32 taxa belonging to the following nine types: Rotifera – 1, Cnidaria – 3, Ctenophora – 2, Annelida – 1, Echinodermata – 2, Tunicata – 2, Mollusca – 2, Chaetognata – 1, Arthropoda – 18 taxa. 16 species of Copepoda were found, among them: Calanoida – 13 species, Cyclopoida – 1, Harpacticoida – 1, Poecilostomatoida – 1 (Table 3). Copepods have the biggest share in the planktic community. They are a very important group within the marine Arctic food webs because they are a significant link between the primary and secondary productions. Their different stages (nauplii and copepodits) are a substantial food source for juvenile fish, chaetognaths, jellyfish etc.

Table 3: Species composition and distribution of zooplankton in the total samples from the stations located along Transect III (stations 7, 8, 9, 10) and Transect V (stations 15, 19, 20) (continued on next page)

Taxa / Station	**7**	**8**	**9**	**10**	**15**	**19**	**20**
Rotifera							
Asplanchna priodonta Gosse			+	+	+		
Arthropoda							
Copepoda							
Acartia longiremis (Lilljeborg)		+	+	+	+	+	
Oithona atlantica Farran	+						
Oithona similis Claus	+	+	+	+	+		
Calanus glacialis Jaschnov							
Calanus finmarchicus (Gunvier)	+	+	+		+	+	
Calanus hyperboreus Kroyer				+			
Jaschnovia tolli (Linko)						+	
Limnocalanus macrurus G.O. Sars					+	+	+
Microselella norvegica (Boeck)	+	+	+	+	+		
Metridia longa (Lubbock)	+						
Oncaea borealis G.O. Sars	+	+	+		+		
Drepanopus bungei G.O. Sars	+	+				+	+
Microcalanus pygmaeus (G.O. Sars) *Pseudocalanus acuspes* (Giesbrecht)		+	+		 +	+	+
Pseudocalanus major G.O. Sars						+	
Pseudocalanus minutus (Kroyer)		+	+		+	+	
Nauplii	+	+	+	+	+	+	+
Clausocalanidae juv.	+	+	+	+	+	+	+
Amphipoda							
Euphausiacea			+			+	
Cnidaria							
Hydromedusae		+					
Aeginopsis laurentii Brandt	+			+	+		
Obelia spp.		+	+	+			
Ctenophora		+	+				
Annelida							

Table 3 (continued): Species composition and distribution of zooplankton in the total samples from the stations located along Transect III (stations 7, 8, 9, 10) and Transect V (stations 15, 19, 20)

Taxa / Station	7	8	9	10	15	19	20
Polychaeta sp. larvae	+	+	+		+		
Echinodermata							
Bipinnaria			+		+		
Ophioplutei		+	+		+		
Tunicata							
Appendicularia							
Fritillaria borealis Lohmann	+	+	+		+		
Oikopleura vanhoeffeni Lohmann							
Mollusca							
Bivalvia		+	+	+	+		
Veliger larvae	+	+	+		+		
Pteropoda							
Clione limacina Phipps	+						
Limacina helicina Phipps		+					
Chaetognatha					+		
Sagitta sp.	+	+	+	+			
Amount of species:							
Rotifera	**0**	**0**	**1**	**1**	**1**	**0**	**0**
Copepoda	**7**	**8**	**7**	**4**	**8**	**8**	**3**
Others	**6**	**10**	**10**	**4**	**8**	**1**	**0**
Total species diversity	**13**	**18**	**18**	**9**	**17**	**9**	**3**

The total number of zooplankton species ranged from 3 to 18 at different stations (Table 3). The highest species diversity was registered in the western part of the Laptev Sea shelf (stations 8 and 9) and the lowest in the southeast region (station 20). The greatest number of zooplankton (27,450 ind./m^3) with a biomass of 0.073 g/m^3 was also found in the western Laptev Sea at station 2 (Fig. 42). The average abundance in this region was 11,080 ind./m^3. That is more than three times higher in comparison to the eastern area of the shelf where the average zooplankton abundance and biomass were 3,160 ind./m^3 and 0.026 g/m^3 respectively.

The most plentiful groups that were present at all stations were Nauplii, Copepoda and juvenile stages of the Clausocalanidae famile. The average relative abundance of naupliar stages makes up 34% of the total zooplankton abundance in western Laptev Sea (Transect III) and that of juvenile Clausocalanidae species makes up 10%. The shares of these two groups in the total number of organisms in the eastern region were 24% and 37%, respectively (Transect V). The relative biomass of these young stages varies from 2 to 26% in the different areas of the Laptev Sea shelf.

One aim of our investigation during TRANSDRIFT XXI was to gather information about the composition of mesozooplankton community and species distribution along the salinity gradient from the more marine western part of the Laptev Sea to the freshened eastern area.

The cosmopolitic marine euryhaline cylopoida *Oithona similis* and the Arctic marine calanoida *Calanus hyperboreus* were the most abundant species in the western Laptev Sea and played a significant role in the total zooplankton biomass in this region (Fig. 47).

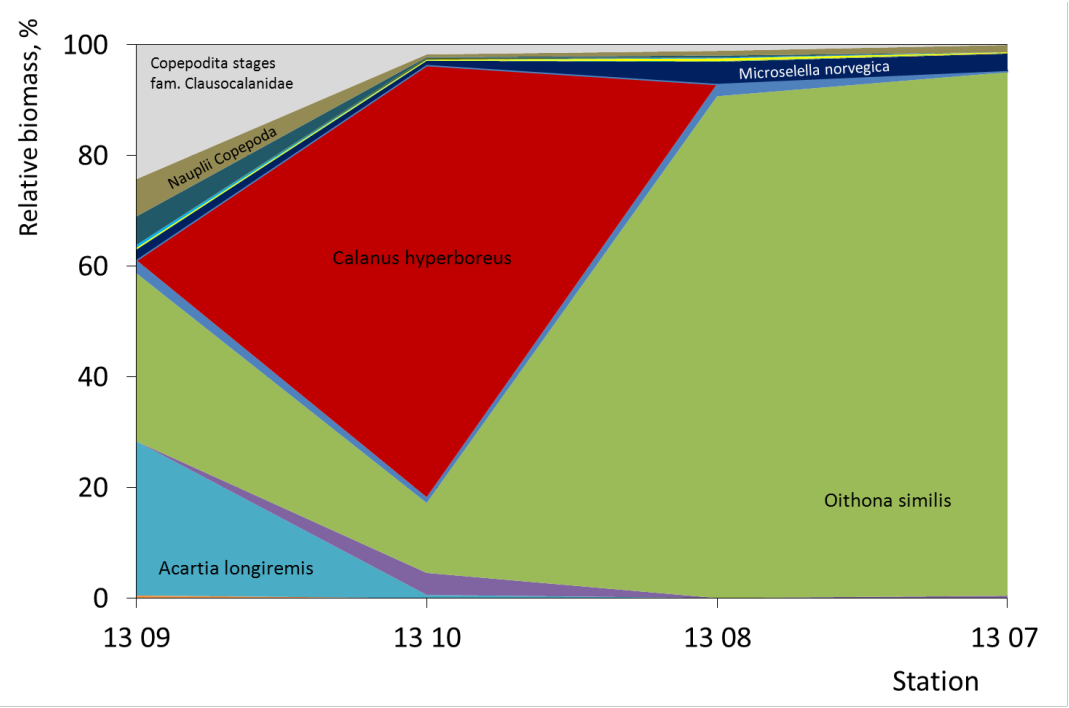


Fig. 47: Relative biomass distribution of the dominant copepods in the western Laptev Sea (Transect III).

Oithona similis was very numerous in the eastern part, too. But here, an increasing abundance and biomass of brackish-water species (*Pseudocalanus major*, *Acartia longiremis* and especially *Limnocalanus macrurus*) were clearly observed (Fig. 48). This shows clearly that the huge freshwater discharge of the Lena River has a dominant influence not only on the oceanography of the Laptev Sea shelf, but also on the formation of the pelagic community. The high freshwater input creates a well-pronounced stratification of the water column in the eastern Laptev Sea. In addition, the large amounts of nutrients and detritus in this region create specific food conditions for the zooplankton species inhabiting the freshened surface layers.

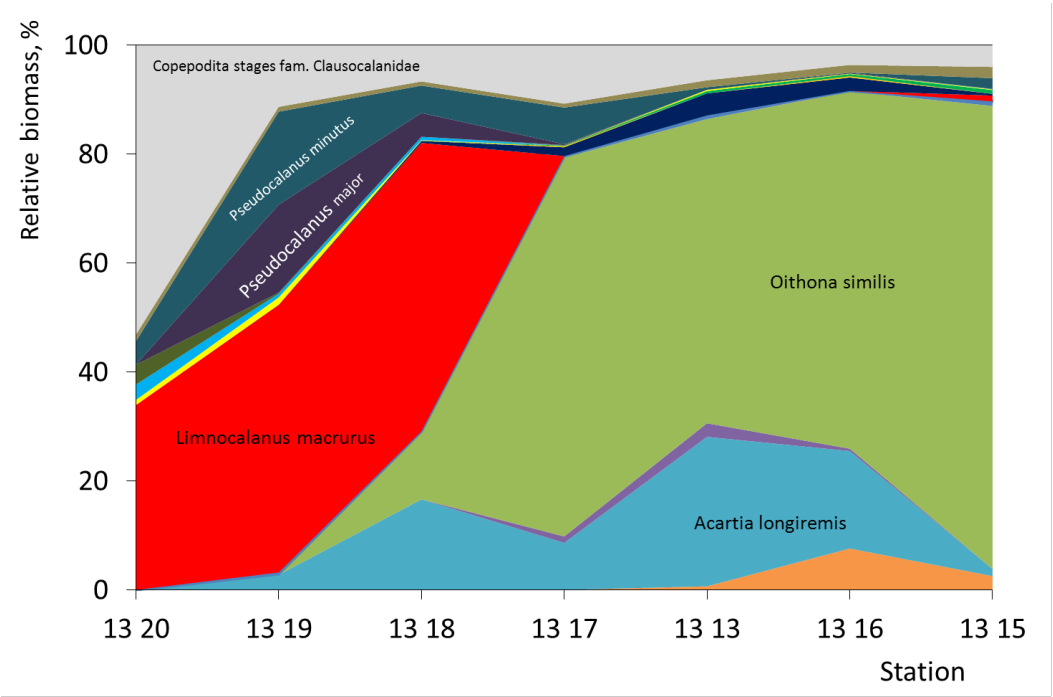


Fig. 48: Relative biomass distribution of the dominant copepods in the eastern Laptev Sea (Transects IV and V).

The successful interdisciplinary work of all scientists on board RV VIKTOR BUYNITSKIY will allow us to interpret the obtained biological data in fully investigated hydrological and hydrochemical conditions after processing all data.

References

Clarke, K.R., Warwick, R.M. (2001) A further biodiversity index applicable to species lists: variation in taxonomic distinctness. Marine Ecology Progress Series, 216: pp. 265-278.

Hillebrand, H., Dürselen, C.D., Kirschtel, D., Pollingher, D., Zohary, T. (1999) Biovolume calculation for pelagic and benthic microalgae. Journal of Phycology, 35: pp. 403-424.

Menden-Deuer, S., Lessard, E.J. (2000) Carbon to volume relationships for dinoflagellates, diatoms, and other protist plankton. Limnology & Oceanography, 45: pp. 569-579.

Radchenko, I.G., Kapkov, V.I., Fedorov, V.D. (2010) Practical Guide for Collection and Analysis of Marine Phytoplankton Samples. Moscow: Mordvintsev, 60 pp. (in Russian).

BIOLOGICAL INVESTIGATIONS: PHYTOPLANKTON

I. Kryukova
Institute of Water Problems of the Russian Academy of Sciences, Moscow, Russia

During the TRANSDRIFT XXI expedition, samples for the phytoplankton study were taken at 16 stations. A total of 116 water samples and 28 net samples were collected.

For the quantitative analysis, water samples of 1 l were collected with a rosette sampler equipped with 2.5-l Niskin bottles. Sampling was conducted at defined water depths (2 m, 5 m, 10 m, 15 m … and near the seafloor). Immediately after sampling, the algae were fixed with 4% neutralized formalin. In the laboratory, the processing method will include filtration of the water samples through nuclear pore filters (1 micron pore size) with a pressure of not more than 0.2 bar. After that the filters will be stored in plastic bottles with 4% neutralized formalin for further microscopic examination.

For the qualitative analysis, the samples were taken with an Apstein net (Hydro-Bios, mesh size 20 μm, diameter 20 cm). At each station a net was twice towed through the water column: from the seafloor to the surface layer and from the pycnocline to the surface layer. Samples were preserved with 4% neutralized formalin and stored until they will be analyzed at a land-based laboratory.

The microscopic examination of all samples will be carried out at the Laboratory of Pleistocene Paleogeography (Moscow State University) and the OSL. Counting and identifying phytoplankton will be carried out using a standart (non-inverted) light microscope (Zeiss Axiovert; Olympus) at 200× and 400× magnification in a 0.05-ml Nageotte chamber. For species that will not be identified with light microscopy, a scanning electron microscope will be used (P.P. Shirshov Institute of Oceanology, Moscow). Cell counts will be converted to cell concentration as described by Radchenko et al. (2010). Phytoplankton biomass will be estimated using taxon-specific carbon values (Menden-Deuer & Lessard, 2000) and the biovolume of algae will be calculated from the volumes of appropriate stereometrical bodies (Hillebrand et al., 1999).

Statistical analyses will be carried out with the PRIMER Version 5.2.4. (Clarke & Warwick, 2001). The similarity of phytoplankton at different stations will be calculated from the relative contributions of algae to total biomass. A similarity matrix for species data will be constructed employing the Bray-Curtis index. Patterns in the ordination of samples will be explored by non-metric multidimensional scaling (MDS) (Clarke & Warwick, 2001).

The Shannon-Wiener diversity index will be used to analyze species diversity.

The relationship between the phytoplankton community and environmental factors (salinity, temperature, nutrients) will be analyzed by canonical correlation analysis (CCA) using Canoco for Windows 4.0 soft.

References

Clarke, K.R., Warwick, R.M. (2001) A further biodiversity index applicable to species lists: variation in taxonomic distinctness. Marine Ecology Progress Series, 216: pp. 265-278.

Hillebrand, H., Dürselen, C.D., Kirschtel, D., Pollingher, D., Zohary, T. (1999) Biovolume calculation for pelagic and benthic microalgae. Journal of Phycology, 35: pp. 403-424.

Menden-Deuer, S., Lessard, E.J. (2000) Carbon to volume relationships for dinoflagellates, diatoms, and other protist plankton. Limnology and Oceanography, 45(3): pp. 569-579.

Radchenko, V.I., Loboda, S.V., Figurkin, A.L., Gorbatenko, K.M., Ovsyannikov, E.E. (2010) Environmental conditions and compositions of plankton and nekton in the epipelagic zone of the Northwestern Pacific Ocean in summer 2009, the year of the largest spawning

migration of pink and chum salmon. Russian Journal of Marine Biology, 36(7): pp. 473-488.

BIOLOGICAL INVESTIGATIONS: BENTHOS

D. Piepenburg, F. Müller
Institute for Ecosystem Research of Kiel University, Kiel, Germany

In extension of the data obtained in the course of the past TRANSDRIFT cruises to the Laptev Sea, faunal and biogeochemical benthic studies were performed during the cruise of RV VIKTOR BUYNITSKIY at four stations (Station 5: Vilkitsky Trough, Station 9: Khatanga Valley South, Station 15: Kotelnyy, and Station 16: seafloor observatory 1893) at water depths of 36 to 340 m between September 7 and 15, 2013.

Benthic samples were taken by means of a multicorer (Fig. 49). Incubations of 2-3 replicate sediment cores with inhabiting communities (bacteria, meiofauna, macrofauna) and overlying boundary water were conducted in a temperature-regulated fridge (1.5-2.0 °C; Fig. 50) to quantify benthic respiration and, hence, carbon remineralization. Moreover, samples from the water phase were taken to determine silicic acid, nitrate, ammonium and phosphate remineralization rates. In addition to the sediment cores, 2-3 controls (cores without sediment, with boundary water only) were incubated and sampled for assessing the oxygen and nutrient turnover due to processes within the bottom-water column.

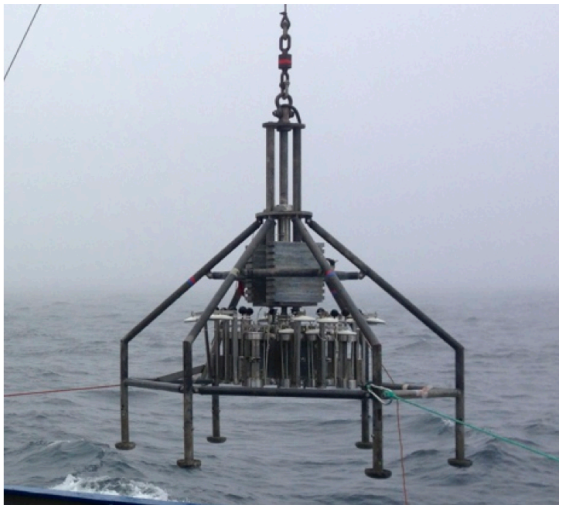


Fig. 49: Multicorer (MUC) used during the TRANSDRIFT XXI expedition.

After incubation, the sediment cores were passed through a 0.5-mm-mesh sieve under slowly running seawater, and the sieve residues were preserved in a 4% seawater-formaldehyde solution for later analyses of species diversity, composition and abundance under a dissection microscope. Samples from the sediment surface (0-1 cm) of additional cores were frozen immediately at -20 °C for later pigment analysis.

Preliminary results

While the nutrient and faunal samples have yet to be analyzed in the laboratory, oxygen values and respiration rates were already determined in collaboration with our Russian colleagues from the AARI by Winkler titration on board of the research vessel. The overall oxygen-uptake rates in the cores ranged between 2.5 and 6.1 mmol m^{-2} day^{-1}. As the rates in the water controls were between 0.6 and 1.8 mmol m^{-2} day^{-1}, the sediment-community respiration is estimated to lie between 2.0 and 5.0 mmol m^{-2} day^{-1} (Fig. 51). These values are in the lower range of rates determined in the Canadian Arctic at comparable water depths,

suggesting that the Laptev Sea is not characterized by a pronouncedly lower benthic ecosystem functioning (BEF) than other Arctic marginal seas.

Fig. 50: Incubation of sediment cores in a temperature-regulated fridge (1.5-2.0 °C).

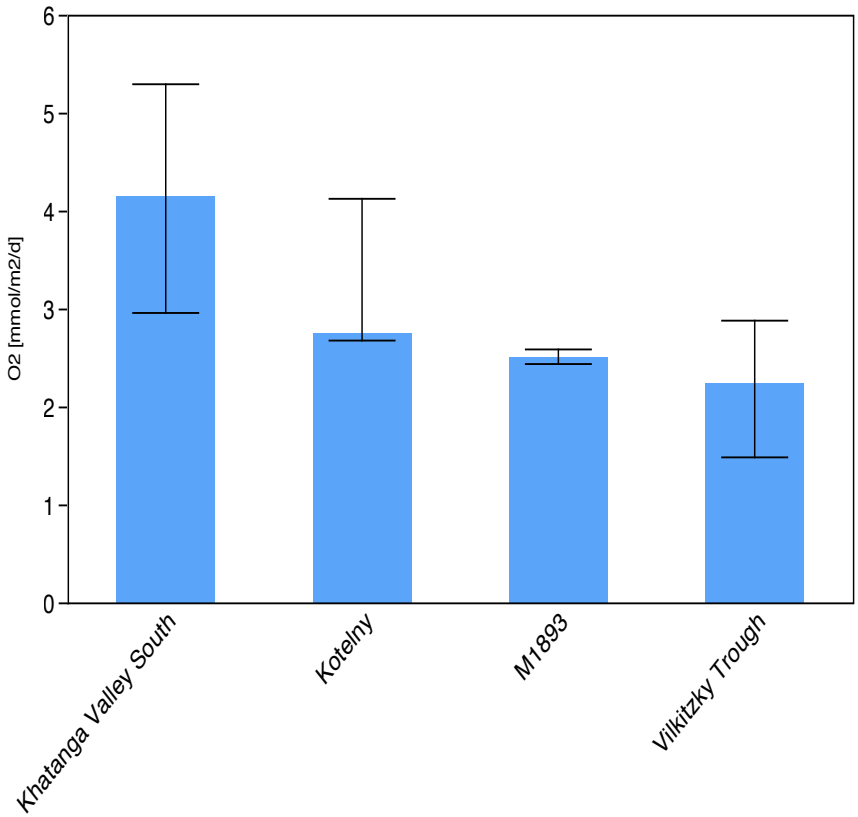


Fig. 51: Sediment-community respiration rates determined in the Laptev Sea in September 2013 during the TRANSDRIFT XXI cruise of RV VIKTOR BUYNITSKIY.

BIOLOGICAL INVESTIGATIONS: BENTHIC FORAMINIFERAL ASSEMBLAGES

S. Korsun, Ya. Ovsepyan
P.P. Shirshov Institute of Oceanology of the Russian Academy of Sciences, Moscow, Russia

The aim of activity during the TRANSDRIFT XXI expedition was to collect new samples from the Laptev Sea shelf and continental slope for modern foraminifera studies and Mid- to Late Holocene paleoenvironmental reconstructions based on the distribution of microfaunal assemblages in sediment cores.

Methods

The research vessel was equipped with a multicorer (abbreviation: MUC). It takes 12 short cores of soft seafloor deposits with undisturbed sediment-water interface and a small amount of bottom water. Thus, 290 samples were obtained for different microfaunal analysis. These are as follows:

- distribution pattern of live and dead foraminifera assemblages in the Laptev Sea surface sediments in comparison with environmental parameters, which will enlarge the existing database;
- investigation of downcore distribution of living infaunal foraminifera species in cores from shallow and deep parts of the sea;
- high-resolution microfauna study of multicore sediment sequences in order to reconstruct environmental changes and climate variability during the Mid- to Late Holocene in the Laptev Sea;
- investigation of the biodiversity of alive "naked", soft-shell, agglutinated and fragile calcareous foraminifera in modern surface sediments.

Sampling process, working on board the ship

Seafloor sediments (water depth range from 16 m to 230 m) were retrieved with the MUC and sampled on board. The length of the sediment cores varied from 5 cm to 28 cm for different deployments. The uppermost layer represented a surface sediment sample of 9.5 cm in diameter (Fig. 52a), sometimes with macrobenthos (*Ophiuroidea, Bivalvia, Crustacea)*.

The sequence described for Station VB1301 is typical for the Laptev Sea shelf (Fig. 52b):

- 0-3 cm: clayey-sandy silt, brown, very soft, bioturbated, with shell fragments;
- 3-11 cm: silty clay, olive brown, soft, black spots of organic matter, bioturbated, shell debris;
- 11-18 cm: silty clay, dark grey, black spots and lenses of organic matter (which sometimes provide pseudo-stratification), shell debris.

The upper (1-2 cm thick) very soft sediment layer was taken into bottles, fixed with 75% ethanol and stained with Rose Bengal in order to reveal the presence of cytoplasm within the foraminiferal shells. This type of sampling was done at each station where the MUC was deployed in order to identify the percentage of live and dead foraminiferal tests for quantitative modern distribution study.

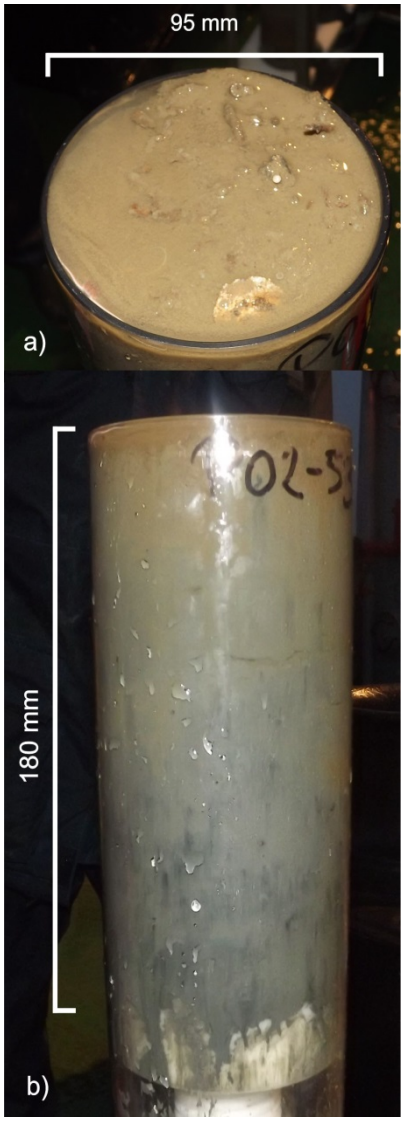


Fig. 52: A photograph of surface sediment (a) and short core section (b) obtained with the MUC at Station VB1301.

The upper 8 cm of several cores were sliced with 1 cm increment and stained with Rose Bengal for studying the downcore distribution of living infaunal foraminifera. To obtain statistically reliable data, the Rose Bengal-stained samples were collected in two replicates at each station. These samples were stored in bottles.

The sediment cores longer than 15 cm were sliced every 2 cm, stored in zip-locks and frozen. In case of successful MUC deployment, three cores were taken for different micropaleontological analyses (foraminifera, ostracoda, spore and pollen). The possibility to study undisturbed sediment sequences, obtained by a multicorer, provides an opportunity to carry out high-resolution reconstructions of Mid- to Late Holocene time interval.

The sediment samples from residual MUC tubes were washed over a 125-µm mesh-size sieve and investigated for living-foraminifera biodiversity. Living foraminifers were stored in Petri dishes with bottom sea water in a cool storage place.

Material obtained

During the cruise, 290 samples from 13 stations were obtained. 44 of them were analyzed on board for biodiversity. 246 samples were collected for future processing in the laboratory: 51

bottles containing Rose Bengal-stained surface sediments and 195 frozen core slices (Table 4).

Table 4: Number of samples for foraminifera analysis (TRANSDRIFT XXI)

Station no.	Latitude		Longitude		Water depth [m]	No. of samples		
						Rose Bengal stained	Frozen sediment	Live forams sieved
VB13-01	75	25.40	87	1.50	45	2	24	6
VB13-05	77	0.07	112	59.05	320	12		4
VB13-07	77	57.25	112	58.15	58			2
VB13-09	74	29.95	114	30.46	36	11		4
VB13-10	75	31.29	114	59.58	44	2	29	4
VB13-12	75	30.05	122	29.55	49	2	24	4
VB13-14	75	31.90	134	55.93	38	2		4
VB13-15	77	32.04	130	57.00	67	2	13	3
VB13-16	76	1.33	125	59.15	45	2	38	2
VB13-17	74	42.77	125	25.70	41	2	26	3
VB13-18	74	19.83	127	56.89	31	2	14	1
VB13-19	74	0.38	130	55.26	18	6	27	4
VB13-20	72	30.12	130	55.52	16	6		3
Total 290 samples								

APPENDIX

- List of participants
- Station list
- Seafloor observatories
- Daily reports
- Press releases

A – List of participants

LIST OF PARTICIPANTS

No.	Name	Affiliation
1	Abramova, Ekaterina	Lena Delta Nature Reserve
2	Chernyavskaya, Ekaterina	Arctic and Antarctic Research Institute
3	Dobrotina, Elena	Arctic and Antarctic Research Institute
4	Hölemann, Jens	Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research
5	Ipatov, Alexandr	Arctic and Antarctic Research Institute
6	Janout, Markus	Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research
7	Juhls, Bennet	GEOMAR Helmholtz Centre for Ocean Research Kiel
8	Kassens, Heidemarie	GEOMAR Helmholtz Centre for Ocean Research Kiel
9	Korsun, Sergey	P.P. Shirshov Institute of Oceanology RAS
10	Kryukova, Irina	Institute of Water Problems of the Russian Academy of Sciences
11	Laukert, Georgi	GEOMAR Helmholtz Centre for Ocean Research Kiel
12	Martynov, Fedor	Arctic and Antarctic Research Institute
13	Monsees, Matthias	Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research
14	Mueller, Felix	Institute of Polar Ecology, Kiel University
15	Ovsepyan, Yaroslav	Moscow State University
16	Piepenburg, Dieter	Institute of Polar Ecology, Kiel University
17	Sandmann, Tim	GEOMAR Helmholtz Centre for Ocean Research Kiel
18	Selitrenikov, Dmitry	School Nr. 517, St. Petersburg
19	Thibodeau, Benoît	Mainz Academy of Sciences, Humanities and Literature

B – Station list

Station: VB13-01

Weather		Wind		Pressure [mb]	Cloudness			Sea			
Temp. (°C)		Speed [m\s]	Direction [°]		Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
1.4		5.5	60	1017.72	Sc St	10	1.0				1
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-time)	End (MT-time)	Start	End	Start	End			
Start of Station		05.09.2013	19:07	23:20	76°59.88		113°00.00	112°54.16	50		
1a	rosette I	05.09.2013	19:21	19:58	76°59.82	76°59.80	112°59.71	112°57.65			
1b	rosette II	05.09.2013	20:01		76°59.93		112°53.05				
2	nets	05.09.2013	20:03	20:41	76°58.80	76°59.88	112°57.32	112°55.24			
3a	rosette III	05.09.2013	20:46		76°59.93		112°51.99				
3b	rosette IV	05.09.2013	21:03	21:10	76°59.94		112°51.19				
4	MUC	05.09.2013	22:09	22:26	77°05.94	77°00.07	112°59.83	112°59.05	46		
5	rosette V	05.09.2013	22:46	22:53	77°00.20	77°00.24	112°56.58	112°56.06	44.7		
6	rosette VI	05.09.2013	23:07	23:17	77°00.36	77°00.46	112°55.00	112°54.16	45.5		
7	UCTD	06.09.2013	23:35	02:24	77°01.24		112°53.42				

Station: VB13-02

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
-1.4		6.1	75	1013.3	St	10	1.0				1
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		06.09.2013	02:35	13:00	77°30.13		113°00.57		63		
1a	rosette I	06.09.2013	02:42	02:48	77°30.14	77°30.11	113°00.64	113°00.16	63		
1b	rosette II	06.09.2013	03:33	03:42	77°30.22	77°30.22	112°57.75	112°57.30			
2	nets	06.09.2013	03:51	04:23	77°30.24	77°30.44	112°56.45	112°54.88			
3	UCTD	06.09.2013	04:32	13:00	77°31.11	78°30.00	112°55.4	113°01.15			

Station: VB13-03

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
-1.3		6.0	100	1010.53	St	10	1.0	SW 130°	1.5	7	1
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		06.09.2013	13:51	19:00	78°30.00		113°01.15		363		
1	rosette I	06.09.2013	13:56	14:40	78°30.02	78°30.28	113°00.85	112°58.37			
2a	nets	06.09.2013	15:12	15:32	78°30.45	78°30.56	112°56.54	112°55.56			
2b	nets	06.09.2013	15:42	16:20	78°30.63	78°30.89	112°54.85	112°53.35			
3a	rosette II	06.09.2013	16:41	16:50	78°30.85	78°30.88	112°52.10	112°51.66			
3b	rosette III	06.09.2013	17:08	17:17	78°30.93	78°30.95	112°50.81	112°50.37			
3c	rosette IV	06.09.2013	17:40	18:06	78°31.02	78°31.12	112°49.38	112°48.29			
3d	rosette V	06.09.2013	18:17	18:36	78°31.17	78°31.30	112°47.88	112°47.08			
3e	rosette VI	06.09.2013	18:47	18:53	78°31.39	78°31.46	112°46.55	112°46.20			

Station: VB13-04

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [s]	Amplitude [m]	Period [s]	Condition
-0.8		11.0	80	1005.08	St	10	0,2	SW 130°	3	6	3
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		07.09.2013	13:20	16:45	78°05.30		112°11.52		335		
1	UCTD	07.09.2013	13:20	16:45	78°05.30	77°56.73	112°11.52	113°06.46			

Station: VB13-05

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)	Time	speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
-0.5	17:00	9.0	90	1005.08	St	10	0.2	SW 130°	3.0	6	3
-1.0	21:06	9.0	130	1003.22	St	10	0.2	SW 130°	3.0	6	3
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		07.09.2013	17:00	07:03	77°56.00		113°06.00		326		
1	mooring Vilkitsky	07.09.2013	17:42	18:15	77°56.77	77°56.92	113°04.05	113°02.023			
2	MUC	07.09.2013	18:40	19:11	77°57.07	77°57.25	113°00.25	112°58.15			
3	nets	07.09.2013	19:23	20:03	77°57.39	77°57.94	112°57.05	112°54.44			
4	rosette I	07.09.2013	21:06	21:27	77°58.48	77°58.74	112°50.78	112°48.67			
5	rosette II	07.09.2013	21:48	21:53	77°58.86	77°58.91	112°47.96	112°47.51			
6	rosette III	07.09.2013	22:17	22:21	77°59.12	77°59.16	112°45.59	112°45.24			
7	rosette IV	07.09.2013	22:41	23:01	77°59.34	77°59.52	112°43.64	112°42.10			
8	rosette V	07.09.2013	23:25	23:46	77°59.71	77°59.86	112°40.44	112°39.04			
9	rosette VI	07.09.2013	23:58	00:05	77°59.95	78°00.01	112°38.21	112°37.77			
10	UCTD	08.09.2013	00:27	07:03	77°59.14	77°11.39	112°39.93	114°50.95			

Station: VB13-06

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
1.0		8.0	120	1002.0	St	10	0.2				3
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		08.09.2013	07:30	21:05	77°10.67		114°59.18		65		
1	we try to got OSL4 signal	08.09.2013	07:47	09:15	77°10.67		114°59.18				
2	creeping by small anchor	08.09.2013	10:45	11:05	77°10.13		114°54.45				
3a	creeping by small anchor	08.09.2013	13:15	13:45		77°10.28		114°53.48			
3b	creeping by small anchor	08.09.2013	13:50	14:07		77°10.28		114°55.1			
3c	recover of anchor	08.09.2013	15:40	15:40							
4a	UCTD	08.09.2013	15:55	17:25	77°10.15	77°15.64	115°01.35	116°00.28			
4b	UCTD	08.09.2013		21:05		77°49.0		116°14.0			

Station: VB13-07

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
1.0	00:59	7.0	160	1002.0	Sc St	10	1.0	SW 100°	2.5	8	2
3.0	11:54	12.0	205	996.97	Sc	10	1.0	SW 150°	3	8	3
Cast	**Activity**	**Date**	**Time**		**Latitude (N)**		**Longitude (E)**		**Water Depth [m]**		
			Start (MT-Time)	**End (MT-Time)**	**Start**	**End**	**Start**	**End**			
Start of Station		09.09.2013	00:59	20:55	77°15.04		115°59.87		58		
1	rosette I	09.09.2013	00:59	01:03	77°15.12	77°15.24	115°59.70	115°59.52			
2	nets	09.09.2013	01:14	01:47	77°15.52	77°16.40	115°59.41	115°59.72			
3	rosette II	09.09.2013	01:57	02:02	77°16.56	77°16.66	115°59.44	115°59.42	62		
4	rosette III	09.09.2013	02:17	02:23	77°16.93	77°17.04	115°59.41	115°59.42	60		
5	rosette IV	09.09.2013	02:32	02:42	77°17.15	77°17.29	115°59.41	115°59.36	64		
6	MUC I	09.09.2013	08:08	09:17	77°14.94	77°15.02	116°01.09	116°00.57	58		
7	MUC II	09.09.2013	09:40		77°14.81		116°01.09		59		
8	MUC III	09.09.2013	09:50	09:58	77°14.99	77°15.17	116°00.25	115°59.57	59		
9a	mooring Taymir I	09.09.2013	11:54	12:10	77°14.98	77°15.422	116°00.23	115°59.460			
9b	Taymir II	09.09.2013	12:15	12:16	77°15.603	77°15.603	115°59.221	115°59.221			
10	nets	09.09.2013	12:25	12:50	77°15.83	77°16.55	115°59.28	115°59.00			
11	UCTD	09.09.2013	13:10	20:55							

Station: VB13-08

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
2.0		8.0	150	995.64	Cu Ns Cufr	8	5.0	SW 150°	2.0	7	2
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		09.09.2013	20:10	09:30	76°15.94		115°22.08		40		
1	rosette I	09.09.2013	20:10	20:28	76°15.96	76°15.97	115°22.04	115°22.01			
2	rosette II	09.09.2013	20:54	20:57	76°15.94	76°15.91	115°21.81	115°21.76			
3	rosette III	09.09.2013	21:13	21:21	76°15.86	76°15.84	115°21.50	115°21.39			
4	rosette IV	09.09.2013	21:28	21:37	76°15.81	76°15.76	115°21.28	115°21.10			
5	nets	09.09.2013	21:45	22:10	76°15.68	76°15.66	115°21.48	115°21.47			
6	UCTD	10.09.2013	22:30	09:30	76°13.82		115°21.14				

Station: VB13-09

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
1.0		8.0	230	992.84	Sc	9	1.0	W 230°	1.5	5	1
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		10.09.2013	09:37	12:55	74°30.02		114°30.16		36		
1	rosette I	10.09.2013	09:45	09:50	74°30.04	74°30.05	114°30.49	114°30.75			
2	rosette II	10.09.2013	10:13	10:18	74°30.06	74°30.06	114°31.78	114°31.96			
3	rosette III	10.09.2013	10:32	10:39	74°30.02	74°30.01	114°32.58	114°32.78			
4	rosette IV	10.09.2013	10:46	10:53	74°29.99	74°29.96	114°33.10	114°33.36			
5	MUC I	10.09.2013	11:10	11:25	74°29.90	74°29.85	114°33.99	114°34.47	37.2		
6	MUC II	10.09.2013	12:14	12:19	74°29.94	74°29.95	114°30.47	114°30.46	37.1		
7	nets	10.09.2013	12:33	12:55	74°29.95	74°29.94	114°30.46	114°30.44			

Station: VB13-10

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
1.8		5.0	200	994.84	As Cu Cufr Sc Ns	7	0.5	W/W 200°	1	3	1
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		10.09.2013	19:27		75°31.30		114°59.46		44		
1	rosette I	10.09.2013	19:29	19:34	75°31.31	75°31.31	114°59.51	114°59.51			
2	rosette II	10.09.2013	19:57	20:03	75°31.31	75°31.31	114°59.50	114°59.51			
3	rosette III	10.09.2013	20:16	20:23	75°31.31	75°31.31	114°59.52	114°59.54			
4	rosette IV	10.09.2013	20:26	20:36	75°31.31	75°31.31	114°59.54	114°59.54			
5	nets	10.09.2013	20:40	21:02	75°31.31	75°31.30	114°59.54	114°59.57			
6	MUC	10.09.2013	21:00	21:17	75°31.30	75°31.29	114°59.56	114°59.58			
7	UCTD	10.09.2013	21:47		75°31.20		115°10.83				

Station: VB13-11

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
1.5		4	180	749		10	2				
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		11.09.2013	03:07	10:07	75°30.01		118°29.37		31		
1	rosette I	11.09.2013	03:10	03:15	75°30.01	75°30.01	118°29.25	118°29.09			
2	nets	11.09.2013	03:23	03:44	75°30.09	75°30.26	118°28.66	118°28.26			
3	UCTD	11.09.2013	04:16	10:07	75°30.18	75°30.02	118°46.50	122°26.26			

Station: VB13-12

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
3.1		4.0	160	995.64	St	10	2.0	SW 130°	3.0	10	3
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		11.09.2013	10:15	18:40	75°30.04		122°29.74		49		
1	rosette I	11.09.2013	10:20	10:25	75°30.05	75°30.06	122°29.73	122°29.66			
2	rosette II	11.09.2013	10:55	11:02	75°30.05	75°30.05	122°29.59	122°29.58			
3	rosette III	11.09.2013	11:07	11:17	75°30.05	75°30.05	122°29.56	122°29.56			
4	nets	11.09.2013	11:25	11:50	75°30.05	75°30.05	122°29.56	122°29.56			
5	MUC	11.09.2013	12:03	12:20	75°30.05	75°30.05	122°29.54	122°29.55			
6	UCTD	11.09.2013	12:40	18:40	75°30.10	75°29.95	122°39.44	125°53.82			

Station: VB13-13

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
4.0		8.0	120	998.56	St Sc	8	1.0	SW 140°	2.0	7	2
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		11.09.2013	19:06	20:45	75°29.85		126°00.38		37		
1	rosette I	11.09.2013	19:08	19:12	75°29.87	75°29.91	126°00.29	126°00.15			
2	rosette II	11.09.2013	19:39	19:43	75°30.15	75°30.20	125°59.15	125°59.00			
3	nets	11.09.2013	19:54	20:05	75°30.38	75°30.54	125°58.44	125°58.15			
4	UCTD	11.09.2013	20:23	23:05	75°32.10	75°59.12	125°58.34	126°00.38			
4b	UCTD	12.09.2013	16:45	20:45	75°30.04	75°29.89	132°38.80	134°59.41			

Station: VB13-14

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
-1.3		10.0	130	1010.8	St	10	1.0	SW 140°	1.5	7	3
Cast	**Activity**	**Date**	**Time**		**Latitude (N)**		**Longitude (E)**		**Water Depth [m]**		
			Start (MT-Time)	**End (MT-Time)**	**Start**	**End**	**Start**	**End**			
Start of Station		12.09.2013	20:55	23:19	75°29.89		134°59.41		38		
1	rosette I	12.09.2013	21:05	21:08	75°30.19	75°30.25	134°59.70	134°59.57			
2	rosette II	12.09.2013	21:36	21:40	75°30.66	75°30.74	134°58.25	134°58.08			
3	rosette III	12.09.2013	21:54	22:02	75°30.95	75°30.10	134°57.56	134°57.14			
4	rosette IV	12.09.2013	22:06	22:12	75°31.12	75°31.22	134°57.08	134°56.74			
5	nets	12.09.2013	22:30	22:50	75°31.39	75°31.84	134°56.37	134°56.02			
6	MUC	12.09.2013	23:04	23:19	75°31.90	75°31.90	134°55.92	134°55.93			

Station: VB13-15

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)	Time	speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
-1.0	13:35	6.0	130	1024.37	Sc	10	10.0	SW 180°	2.0	7	2
-1.3	01:30	10.0	130	1024.37	Sc Cufr	9	10.0	SW 170°	2.5	7	3
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		13.09.2013	13:35	20:35	77°32.00		131°01.09		68		
1	UCTD	13.09.2013	13:35	21:42	76°26.26	77°32.43	133°28.91	133°28.91			
2	rosette I	13.09.2013	22:08	22:13	77°31.58	77°31.56	131°00.76	131°00.48			
3	rosette II	13.09.2013	22:38	22:45	77°31.51	77°31.49	130°59.51	130°59.19			
4	rosette III	13.09.2013	23:00	23:08	77°31.46	77°31.47	130°58.50	130°58.13			
5	rosette IV	13.09.2013	23:12	23:22	77°31.44	77°31.44	130°57.99	130°57.46			
6	nets	13.09.2013	23:37	00:04	77°31.36	77°31.60	130°57.07	130°56.15			
7	MUC I	14.09.2013	00:21	00:42	77°31.95	77°32.01	130°59.62	130°58.30			
8	MUC II	14.09.2013	00:50	01:01	77°32.01	77°32.04	130°57.84	130°57.00			
9	mooring Kotelny	14.09.2013	01:30	02:54							
	deployed	14.09.2013	02:54	03:07	77°29.98	77°30.053	130°59.59	130°58.687			
10	UCTD	14.09.2013	03:50	20:35	77°30.00		130°35.94				

Station: VB13-16

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
0.7		6.5	90	1026.8	Sc St Ns Cu	9	>10.0	SW 100°	2.5	6	2
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		14.09.2013	20:55		75°59.96		125°59.49		45		
1	rosette I, cast 1	14.09.2013	20:56	21:04	75°59.96	75°59.99	125°59.44	125°59.16			
2	nets 1	14.09.2013	21:20	21:50	76°00.11	76°01.53	125°58.76	125°54.85			
3	rosette II, cast 1	15.09.2013	00:00	00:05	76°01.54		125°54.97		46		
4	nets 2	15.09.2013	00:12	00:30	76°01.57	76°01.73	125°54.35	125°53.86			
5a	mooring 1893 I	15.09.2013	01:00	01:08	75°59.90	75°59.900	125°59.77	125°59.391	45		
5b	mooring 1893 II	15.09.2013	02:24	02:44	75°59.94	75°59.990	125°59.92	125°58.762			
5c	mooring 1893 III	15.09.2013	02:48	02:52	76°00.00	76°00.001	125°58.57	125°58.240			
6	rosette III, cast 1	15.09.2013	03:20	03:27	76°00.44	76°00.46	126°04.01	126°03.74			
7	rosette III, cast 2	15.09.2013	03:50	04:00	76°00.64	76°00.72	126°02.50	126°01.91			
8	rosette III, cast 3	15.09.2013	04:05	04:12	76°00.74	76°00.81	126°01.70	126°01.26			
9	nets 3	15.09.2013	04:20	04:40	76°00.94	76°01.25	126°00.61	125°59.62			
10	MUC	15.09.2013	05:55	06:15	76°01.34	76°01.33	125°59.17	125°59.15			
11	rosette IV, cast 1	15.09.2013	06:25	06:35	76°01.33	76°01.33	125°59.15	125°59.14			
12	nets 4	15.09.2013	07:00	07:20	76°01.32	76°01.33	125°59.13	125°59.16			
13	rosette V, cast 1	15.09.2013	10:00	10:05	76°01.34	76°01.34	125° 59.16	125° 59.16			
14	nets 5	15.09.2013	10:12	10:32	76°01.34	76°01.34	125° 59.16	125° 59.46			
15	UCTD	15.09.2013	10:45		76°01.30		125° 59.00				

Station: VB13-17

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
-0.4		7.0	110	1026.89	Sc Ns	9	>10.0	W/W 110°	2.0	5	2
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		15.09.2013	20:02	06:04	74°42.74		125°17.29		41		
1	rosette I	15.09.2013	20:10	20:15	74°42.69	74°42.68	125°16.88	125°16.59			
2	rosette II	15.09.2013	20:37	20:42	74°42.62	74°42.62	125°15.47	125°15.23			
3	rosette III	15.09.2013	20:55	21:02	74°42.59	74°42.59	125°14.52	125°14.22			
4	rosette IV	15.09.2013	21:07	21:15	74°42.60	74°42.60	125°13.95	125°13.56			
5	nets	15.09.2013	21:35	21:56	74°42.68	74°42.90	125°12.52	125°11.68			
6	MUC	15.09.2013	23:07	23:20	74°43.53	74°42.77	125°09.85	125°25.70			
7	mooring Khatanga11	16.09.2013	00:03	00:35	74°42.60	74°42.77	125°17.31	125°16.70			
8	UCTD	16.09.2013	01:30	06:04	74°39.40	74°20.13	125°42.12	125°58.31			

Station: VB13-18

Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
0.1		4.5	100	1028.84	Sc Cu Ns	9	>10.	sw 150°	1.5	12	2
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		16.09.2013	06:20		74°19.84		127°59.94		31		
1	rosette I	16.09.2013	06:30	06:34	74°19.83	74°19.83	127°59.54	127°59.54			
2	rosette II	16.09.2013	06:51	06:54	74°19.83	74°19.83	127°58.10	127°57.80			
3	rosette III	16.09.2013	07:05	07:12	74°19.84	74°19.86	127°59.11	127°56.68			
4	rosette IV	16.09.2013	07:15	07:22	74°19.86	74°19.86	127°56.39	127°55.93			
5a	mooring Anabar10	16.09.2013	07:45	08:45							
5b	dredging	16.09.2013	09:00	09:50							
6	nets	16.09.2013	09:58	10:23	74°19.50	74°19.77	127°59.08	127°57.33			
7	MUC	16.09.2013	10:30	10:42	74°19.83	74°19.83	127°56.83	127°56.89			
8	UCTD	16.09.2013	11:10	16:30	74°19.08	74°00.67	127°06.54	130°53.53			

Station: VB13-19

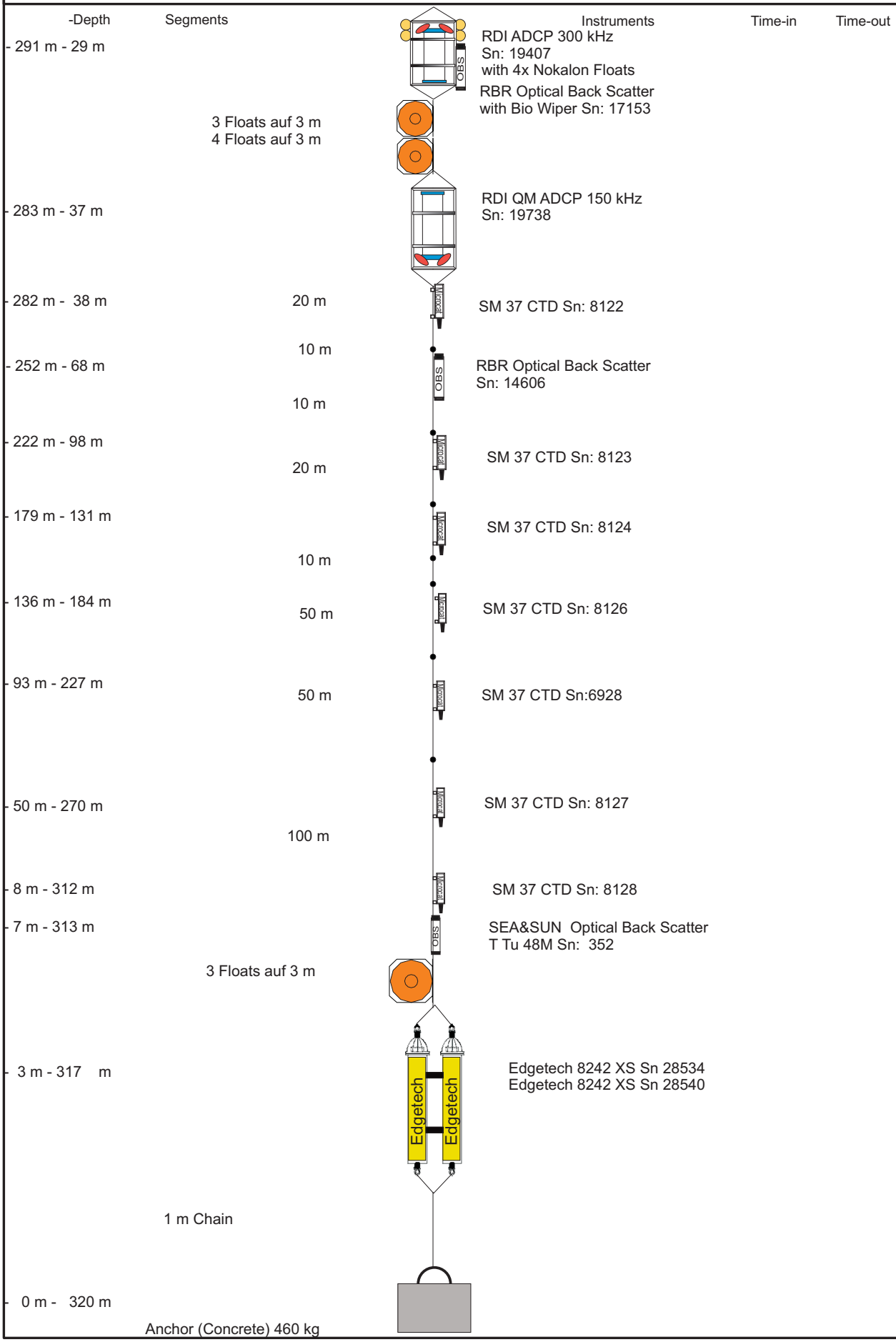
Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
0.0		5.0	70	1028.81	Sc Ns Cb?	8	1.	sw 100°	1.5	8	2
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		16.09.2013	16:50		74°00.01		130°98.83		20		
1	rosette I	16.09.2013	16:58	17:02	74°00.00	74°00.00	130°59.63	130°59.48			
2	rosette II	16.09.2013	17:17	17:23	74°00.00	74°00.02	130°58.86	130°58.64			
3	rosette III	16.09.2013	17:33	17:40	74°00.03	74°00.04	130°58.22	130°57.99			
4	rosette IV	16.09.2013	17:44	17:52	74°00.05	74°00.07	130°57.88	130°57.60			
5	rosette V	16.09.2013	17:54	18:02	74°00.08	74°00.09	130°57.49	130°57.25			
6	rosette VI	16.09.2013	18:11	18:15	74°00.09	74°00.08	130°57.02	130°56.83			
7	nets	16.09.2013	18:28	18:54	74°00.10	74°00.37	130°56.15	130°55.38			
8	MUC	16.09.2013	19:03	19:10	74°00.38	74°00.38	130°55.26	130°55.26			
9	UCTD	16.09.2013	20:00		73°56.93		130°59.43				

Station: VB13-20

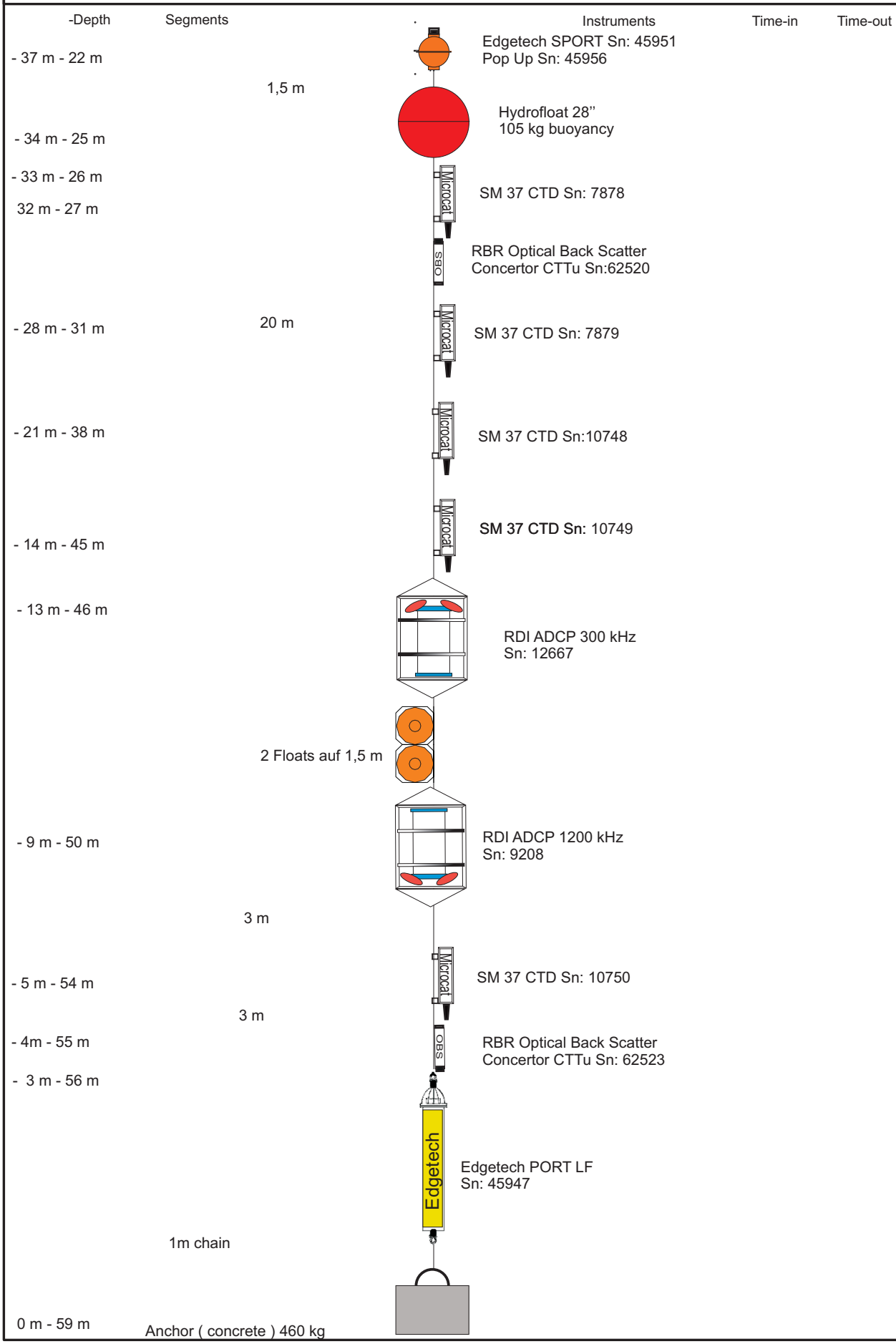
Weather		Wind		Pressure	Cloudness			Sea			
Temp.(°C)		speed [m\s]	direction [°]	[mb]	Formes	Quality	Visibility [km]	Wave direction [°]	Amplitude [m]	Period [s]	Condition
0.1		8.0	40	1022.90	Sc Ns Cufr	10	0.2	sw 40°	2.0	7	2
Cast	Activity	Date	Time		Latitude (N)		Longitude (E)		Water Depth [m]		
			Start (MT-Time)	End (MT-Time)	Start	End	Start	End			
Start of Station		17.09.2013	05:07		72°30.00		130°59.76		16		
1	rosette I	17.09.2013	05:11	05:14	72°29.98	72°29.95	130°59.68	130°59.58			
2	rosette II	17.09.2013	05:27	05:29	72°29.89	72°29.88	130°59.10	130°58.93			
3	rosette III	17.09.2013	05:27	05:29	72°29.87	72°28.86	130°58.05	130°58.26			
4	nets	17.09.2013	06:15		72°29.86	72°30.10	130°56.64	130°55.64			
5	MUC I	17.09.2013	06:34	06:46	72°30.11	72°30.11	130°55.53	130°55.51			
6	MUC II	17.09.2013	07:07	07:18	72°30.12	72°30.12	130°55.52	130°55.52			
7	UCTD	17.09.2013	08:15		72°30.00		130°59.4				

C – Seafloor observatories

Mooring ID: Vilkitzky Position: 77°56,922' N 113°02,023' E
Project : Transdrift XXI Deployed: 07.09.2013 18:15 MKT
Waterdepth: 320 m Released:
05.09.2013 corr. Depth: m Mooring length: 291 m Anchor last

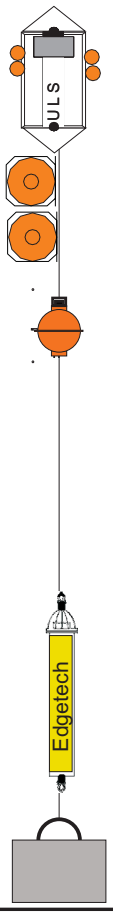


Mooring ID: Taymyr T1 Position: 77°15,422' N 115°59,460' E
Project : Transdrift XXI Deployed: 09.09.2013 12:10 MKT
Waterdepth: 59 m Released:
09.09.2013 corr. Depth: m Mooring length: 37 m Anchor last

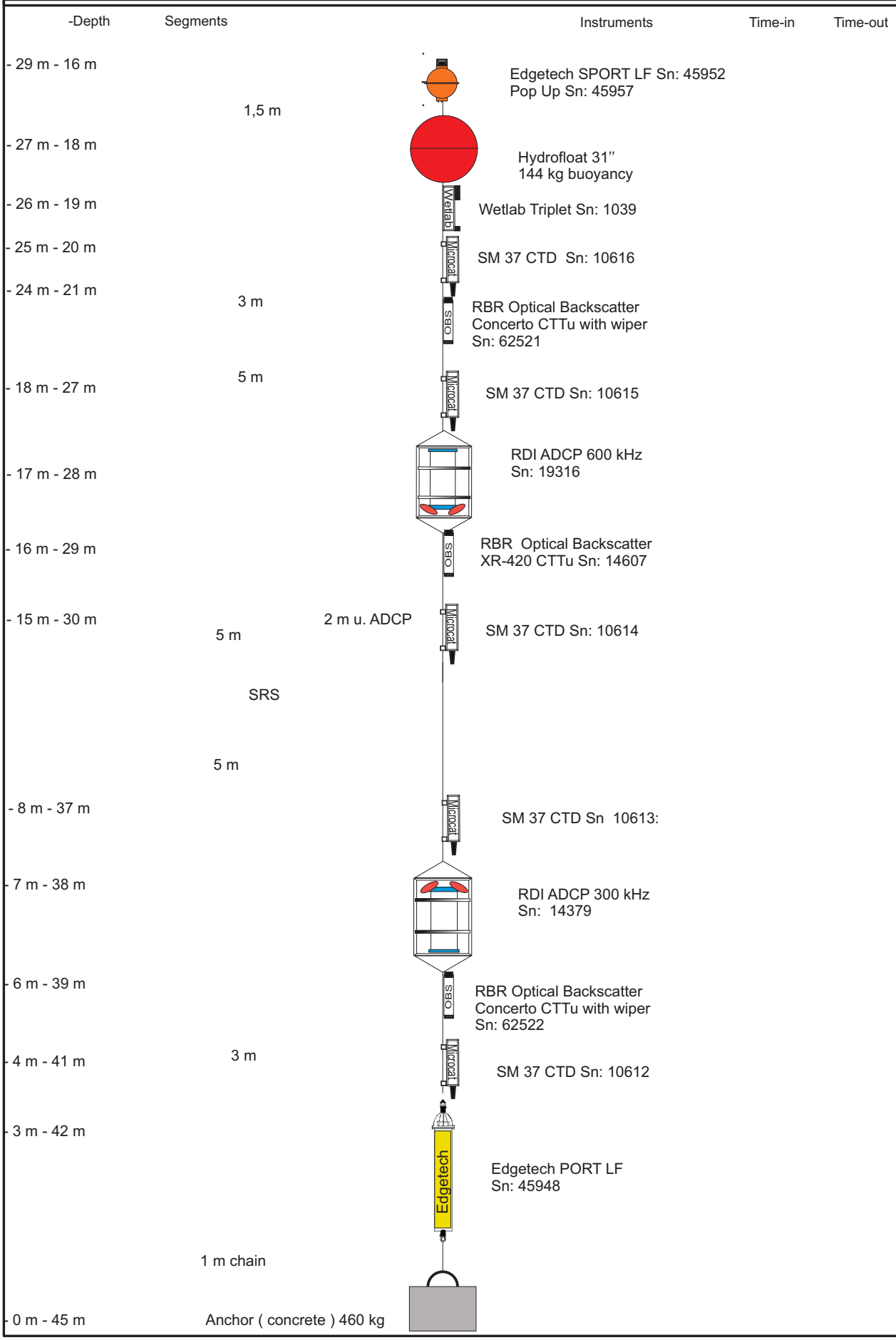


Mooring ID: Taymyr T2 Position: 77°15,603' N 115°59,221' E
Project : Transdrift XXI Deployed: 09.09.2013 12:16 MKT
Waterdepth: 59 m Released:
09.09.2013 corr. Depth: m Mooring length: 37 m Anchor last

-Depth	Segments	Instruments	Time-in	Time-out
- 36 m - 23 m	8x Nokalon Float	ASL Ice Profiler IPS5 Sn: 51154		
	2 Floats auf 3 m			
- 32 m - 27 m		Edgetech SPORT LFSn: 46521 Pop Up Sn: 46522		
	3 m			
	5 m			
	20 m			
- 3 m - 56 m		Edgetech PORT LF Sn: 45949		
	1 m chain			
- 0 -m - 59 m	Anchor (concrete) 460 kg			

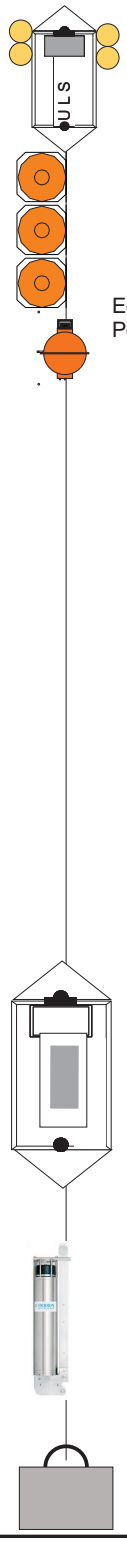


Mooring ID: 1893 - T1 Position:75°59,900' N 125°59,391' E
Project : Transdrift XXI Deployed:15.09.2013 01:08 MKT
Waterdepth: 45 m Released:
15.09.2013 corr. Depth: m Mooring length: 29 m Anchor last

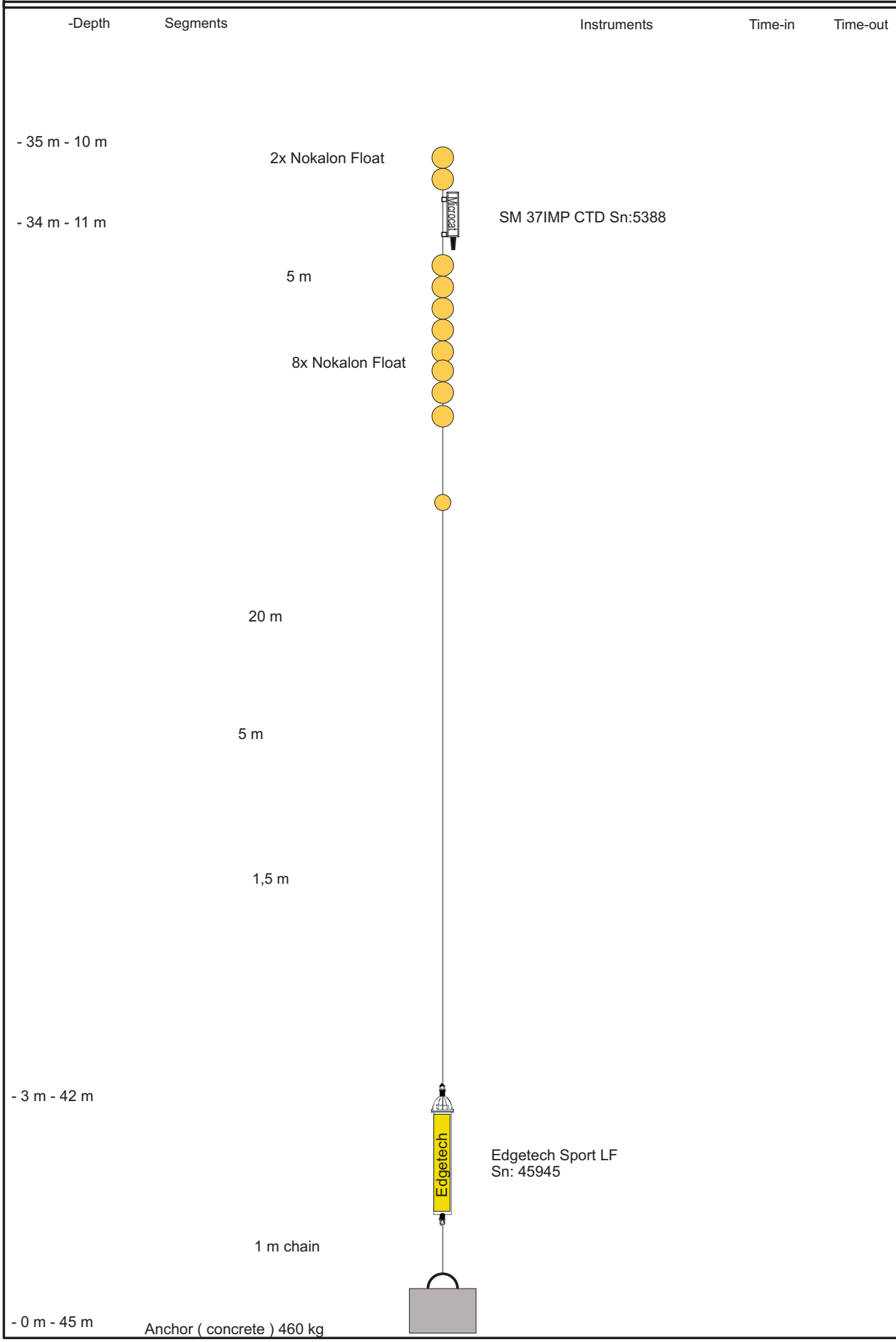


Mooring ID: 1893 - T2 Position: 75°59,990' N 125°58,762' E
Project : Transdrift XXI Deployed: 15.09.2013 02:44 MKT
Waterdepth: 45 m Released:
15.09.2013 corr. Depth: m Mooring length: 25 m Anchor last

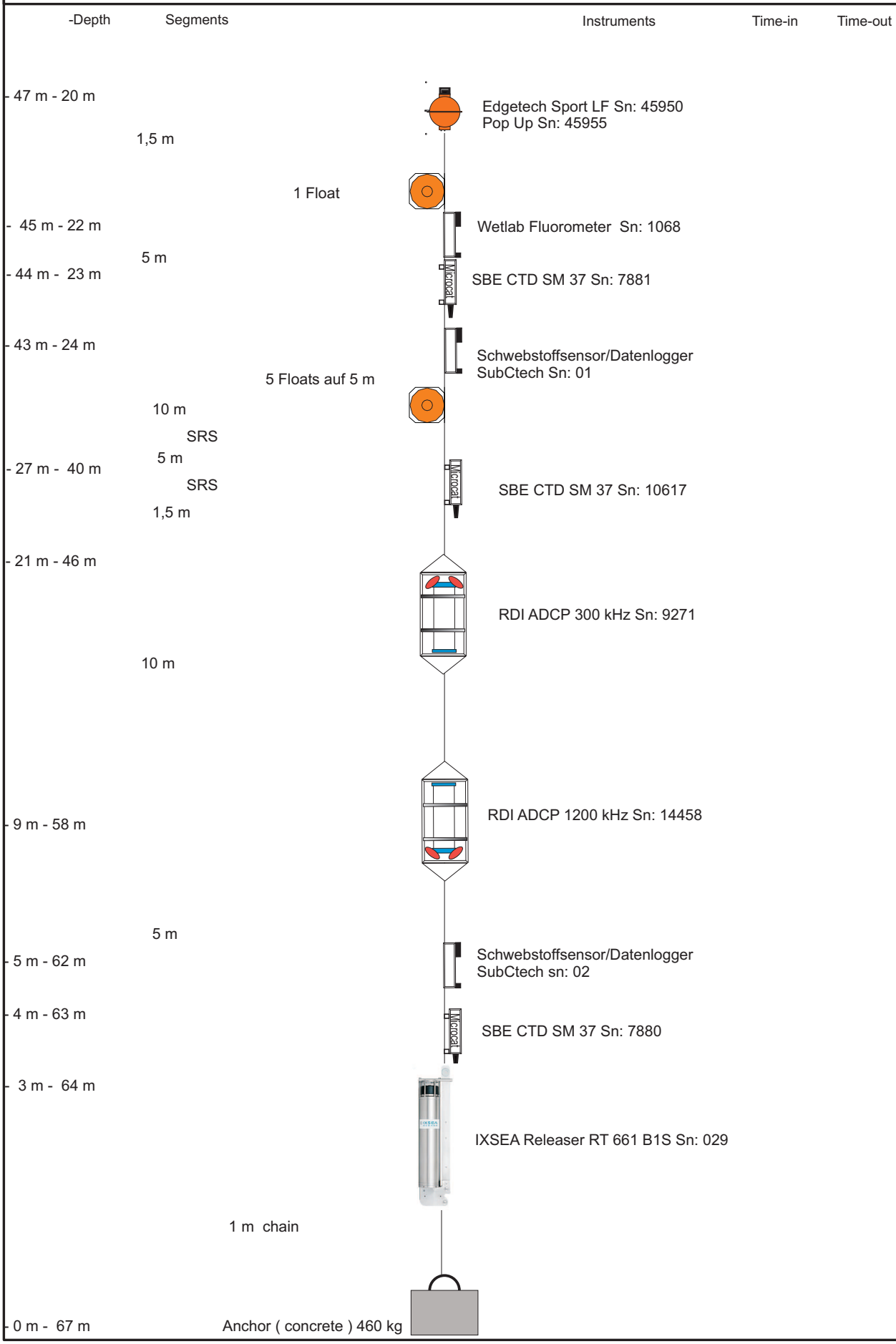
-Depth	Segments	Instruments	Time-in	Time-out
- 20 m - 25 m	8x Nokalon Float	ASL Ice Profiler IPS5 Sn: 51155		
	3 Floats auf 5 m			
- 26 m - 19 m		Edgetech SPORT LF Sn: 45953 Pop Up Sn: 45958		
	10 m			
	SRS			
	1,5 m			
	SRS			
	1,5 m			
- 40 m - 5 m		McLane RAS 100 Watersampler Sn: ML13058-01		
- 42m - 3 m		IXSEA AR 661 Sn: 122		
	1m chain			
-45 m - 0 m	Anchor (concrete) 460 kg			



Mooring ID: 1893 - T3 Position: 76°00,001' N 125°58,240' E
Project : Transdrift XXI Deployed: 15.09.2013 02:52 MKT
Waterdepth: 45 m Released:
15.09.2013 corr. Depth: m Mooring length: 40 m Anchor last



Mooring ID: Kotelnyy Position: 77°30,053' N, 130°58,687' E
Project :Transdrift XXI Deployed: 14.09.2013, 03:07 MKT
Waterdepth: 67 m Released:
14.09.2013 corr. Depth: m Mooring length: 47 m Anchor last



D – Daily reports

Berichte der Expedition TRANSDRIFT XXI

22. August 2013

Heute morgen ging es los: Die deutschen Teilnehmer an der Expedition TRANSDRIFT XXI machten sich auf den Weg zum Flughafen. Um 11:05 Uhr startete die Maschine nach Sankt Petersburg. Dort stoßen die russischen Kollegen zur TRANSDRIFT-Gruppe, und die Reise geht gemeinsam mit dem Flugzeug nach Archangelsk weiter. Heute Abend werden alle an Bord der VIKTOR BUYNITSKIY gehen.

Die Teilnehmer aus Kiel bei der Abreise

25. August 2013, Archangelsk

Um 16 Uhr ist die VIKTOR BUYNITSKIY bei gutem Wetter ausgelaufen. Alles läuft nach Plan: Die Zollformalitäten wurden abgeschlossen, die Container entladen und nun beginnen wir bereits damit, die Labore auf dem Schiff einzurichten.

Die Stimmung an Bord ist sehr gut und wir freuen uns auf die Forschungsarbeiten in der Laptewsee.

Beim Beladen des Schiffes

Jedes Packstück wird genau geprüft

27. August 2013

Das Schiff legt ab!

Am Freitag sind die deutschen Wissenschaftler vom GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel (GEOMAR), vom Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (AWI), vom Institut für Polarökologie der Christian-Albrechts-Universität zu Kiel (IPÖ Uni Kiel) und von der Akademie der Wissenschaften und der Literatur Mainz (Akademie Mainz) von Hamburg über Sankt Petersburg nach Archangelsk geflogen. Während des Umstieges in Sankt Petersburg stießen die russischen Kollegen vom

Staatlichen Institut für Arktis- und Antarktisforschung (AARI) und vom Otto-Schmidt-Labor für Polar- und Meeresforschung hinzu. In Archangelsk angekommen fuhren alle gemeinsam mit einem Kleinbus über die holprigen Vorstadtstraßen bis zum Hafen. Hier erwartete sie das Forschungsschiff VIKTOR BUYNITSKIY.

Die Begrüßung der Schiffsbesatzung an Bord des Schiffes fiel sehr herzlich aus. Die Expeditionsteilnehmer bekamen nach dem anstrengenden Reisetag ein nach russischer Tradition gestaltetes Abendbrot und eine Einweisung in den Alltagsablauf auf dem Schiff. Ebenfalls herzlich fiel die Begrüßung der russischen Kollegen von der Staatlichen Universität von Moskau, vom Lena-Delta-Reservat, vom P.P. Shirshov-Institut für Ozeanographie RAS, vom Institut für Wasserprobleme RAS, vom Geologischen Institut RAS, vom Staatlichen N.N. Zubov-Institut für Ozeanographie (GOIN) und vom AARI aus, die sich bereits an Bord befanden.

Schon am nächsten Tag wurden zwei 20-Fuß-Container mit Forschungsinstrumenten planmäßig von einem LKW aus Sankt Petersburg angeliefert und ausgeräumt. Schnell waren die zahlreichen Messinstrumente dank vieler helfender Hände an Bord des Schiffes verstaut. Ein anschließender Ausflug in die Innenstadt Archangelsks wurde zum Anlass genommen, letzte fehlende Einkäufe zu tätigen.

Am Sonntag, den 25. August, legte die VIKTOR BUYNITSKIY bei sonnigem Wetter in Archangelsk ab.

29. August 2013

An Bord ist alles ok und heute morgen haben wir bei stahlendem Sonnenschein und sommerlichen Temperaturen Geräteeinsätze auf dem Vordeck getestet. Heute Nacht werden wir die Karastraße passieren und am Wochenende die Eisgrenze erreichen.

2. September 2013

Seit heute Nacht liegt die VIKTOR BUYNITSKY vor Anker und wir warten auf die Ankunft des Eisbrechers YAMAL, der uns durch die Wilkizki-Straße begleiten soll. Die Wartezeit haben wir heute genutzt, um alle Geräte zu fahren. Der Test war sehr erfolgreich, und nun sehen wir den Arbeiten in der Laptewsee ungeduldig entgegen.

Der Einsatz des Multicorers wird geprobt

3. September 2013, Wilkizkistraße, 75°59 N, 102°58 E, 17:00 MT

Mit der Karawane durch die Wilkizkistraße

Um Punkt 8:00 Uhr erscheint am Horizont der russische Atomeisbrecher YAMAL, und wir starten pünktlich in Richtung Wilkizkistraße. Noch kommt die sogenannte Karawane, die aus insgesamt vier Schiffen – darunter zwei weitere Forschungsschiffe – besteht, sehr gut voran. In Kürze jedoch werden wir große Eisfelder erreichen, die wir nur mit Hilfe der YAMAL passieren können.

Das Wetter ist sehr gut, und zur Zeit begegnen uns nur kleine Eisfelder.

Viele Grüße von Bord der VIKTOR BUYNITSKIY,

die zufriedenen Expeditionsteilnehmer

Probeeinsatz der "Underway CTD", eines Messgerätes, mit dem während der Fahrt die Leitfähigkeit, Temperatur und Tiefe des Wassers gemessen werden können

Der russische Atomeisbrecher YAMAL

Die Expeditionsteilnehmer stellen sich vor

Ekaterina Abramova, Biologin, Lena-Delta-Reservat

Forschungsschwerpunkte: Ökologie der sibirischen Arktis

Aufgaben an Bord: Beprobung von Zooplankton

Ekaterina Chernyavskaya, Doktorandin, Institut für Arktis- und Antarktisforschung (AARI)

Forschungsschwerpunkte: Thermohaline Struktur der arktischen oberflächennahen Wassersäule

Aufgaben an Bord: Wasserproben und Meereschemie

Elena Dobrotina, Chemikerin, AARI

Forschungsschwerpunkte: Meereschemie

Aufgaben an Bord: Wasserproben und Meereschemie

Jens Hölemann, Meeresgeologe, Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (AWI)

Forschungsschwerpunkte: Schelfprozesse in der sibirischen Arktis

Aufgaben an Bord: Meeresobservatorien und ozeanographische Messungen sowie Wasserproben

Alexandr Ipatov, Ozeanograph, AARI

Forschungsschwerpunkte: Strömungen in der Laptewsee

Aufgaben an Bord: Expeditionsleitung

Markus Janout, Ozeanograph, AWI

Forschungsschwerpunkte: Arktische Ozeanographie, Schelfmeerozeanographie

Aufgabe an Bord: Meeresobservatorien und ozeanographische Messungen, GPS, Software

Bennet Juhls, Student M.Sc. Marine Geosciences, Christian-Albrechts-Universität zu Kiel

Forschungsinteressen: Schwebstoffe in der Wassersäule

Aufgabe an Bord: Wasserproben, Kommunikation, Logistik

Heidemarie Kassens, Meeresgeologin, GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel

Forschungsschwerpunkte: Paläo-Ozeanographie der Arktis

Aufgabe an Bord: Expeditionsleitung

Sergey Korsun, Meeresbiologe, P.P. Schirschow-Institut für Ozeanographie der Russischen Akademie der Wissenschaften (RAS)

Forschungsschwerpunkte: Verteilung von Foraminiferen am Meeresboden

Aufgabe an Bord: Oberflächensedimente

Irina Kryukova, Doktorandin, Institut für Wasserprobleme RAS / Staatliche Universität Moskau

Forschungsschwerpunkte: Phytoplanktonverteilung, saisonale Dynamik

Aufgabe an Bord: Wasserproben und Netzfänge

Georgi Laukert, Doktorand, GEOMAR

Forschungsschwerpunkte: Neodym-Isotopenverhältnisse und Verteilung von Seltenen Erden in der Wassersäule und am Meeresboden

Aufgabe an Bord: Wasserproben und Oberflächensedimente, Logistik

Yuri S. Lukyanov, Leiter des Labors für Meereschemie, Staatliches N.N. Subow-Institut für Ozeanographie (GOIN)

Forschungsschwerpunkte: Entwicklung von Standard-Methoden in der Meereschemie

Hauptarbeitsgebiete: Barents- und Karasee, Kaspisches Meer sowie die Wolga

Aufgabe an Bord: Expeditionsleitung

Fedor Martynov, Doktorand, Otto-Schmidt-Labor für Polar- und Meeresforschung / Staatliche Universität Sankt Petersburg

Forschungsschwerpunkte: Verteilung von Chlorophyll a

Aufgabe an Bord: Wasserproben, Beprobung von Zooplankton

Matthias Monsees, Verankerungstechniker, AWI

Aufgabe an Bord: Aussetzen und Bergen der Meeresobservatorien

Felix Müller, Student M.Sc. Biological Oceanography, Christian-Albrechts-Universität zu Kiel

Forschungsinteressen: Fauna des Meeresbodens

Aufgabe an Bord: Oberflächensedimente und biogeochemische Messungen

Yaroslav Ovsepyan, Doktorand, Staatliche Universität Moskau / Geologisches Institut RAS

Forschungsschwerpunkte: Foraminiferen in der Arktis, Paläo-Ozeanographie

Aufgabe an Bord: Oberflächensedimente

Dieter Piepenburg, Professor für Meeresbiologie, Christian-Albrechts-Universität zu Kiel / Institut für Polarökologie

Forschungsschwerpunkte: Bodenfauna (Benthos) der polaren Meere

Aufgaben an Bord: Koordination der biologischen Arbeiten, Oberflächensedimente und biogeochemische Messungen

Nadezhda Pravdina, Masterstudentin in Geographie, Staatliche Universität Sankt Petersburg

Aufgabe an Bord: hydrochemische Messungen

Tim Sandmann, Konstrukteur, K.U.M. Umwelt- und Meerestechnik Kiel GmbH
Schwerpunkte: Meerestechnik und Tiefseeinstrumentierung
Aufgaben an Bord: Meeresobservatorium, Elektronik, Software, Kommunikation

Dmitry Selitrenikov, Praktikant
Aufgabe an Bord: Von allem ein bisschen

Benoit Thibodeau, Geologe, Akademie der Wissenschaften und der Literatur Mainz
Forschungsschwerpunkte: Stabile Isotope
Aufgaben an Bord: Wasserproben und Oberflächensedimente

Natalia Tikhonova, Ozeanographin, GOIN
Aufgabe an Bord: Ozeanographie der Karasee

29. August 2013: Ekaterina Chernyavskaya

Tagesbericht	Daily report	Résumé de la journée
Irgendwo in der Karasee. Einige von uns haben Messgeräte getestet. Das Wetter ist wirklich schön. Es ist sonnig und das Meer ist ruhig.	Somewhere in the Kara Sea. Some of us have checked our equipment. The weather is really nice. It's sunny and the sea is calm.	Aujourd'hui, nous sommes dans la mer de Kara, nous avons vérifié notre équipement. La météo est très bonne, c'est ensoleillé.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Alle sind beschäftigt und enthusiastisch
- Bist Du zufrieden mit der Proben-/Datenausbeute?

Noch nicht

- Welches Essen hat Dir bisher am besten gefallen?
  Die Schokokekse „Kremenkulskoje“ und Melone
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Die Schokokekse „Kremenkulskoje“. Ich mache mir zudem Sorgen, dass das Klopapier bald alle ist (Anm. d. Red.: Keine Sorge, es gibt noch genug!)
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Tollste: Schokokekse „Kremenkulskoje“; schrecklichste: Mücken in der Kabine
- Welche Bereiche an Bord meidest Du unbedingt?
  Die Last – sie ist tief und dunkel
- Eine interessante Unterhaltung hattest Du mit ...
  Yaroslav über die Verwendung von Foraminiferen als moderne Kunst
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Ein wunderschöner Sonnenuntergang
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Austern
- Was vermisst Du von zu Hause am meisten?
  Mein weiches und kuscheliges Kissen
- Vervollständige den Satz: Nachts um halb drei ...
  hat unser Schiff die Karastraße passiert, während ich geschlafen habe

>> Mood barometer <<

- What is the general mood on board?
  Busy and cheerful
- Are you content with the samples/data you have obtained?
  Not yet
- What kind of food is your favorite on board?
  Chocolate biscuits "Kremenkulskoe" and melon
- Your opinion: What will be used up first?
  Chocolate biscuits "Kremenkulskoe" and I also worry a bit about toilet paper
- What is your most amazing/worst discovery on board?
  Amazing: chocolate biscuits "Kremenkulskoe"; worst: loads of mosquitos in our cabin
- Is there any place on the ship you prefer not to visit?
  Hold – it is deep and dark
- You had an interesting talk with ...
  Yaroslav about using foraminifera as an object of modern art
- What was the most exciting weather/nature phenomenon so far?
  A beautiful sunset
- What will be the first drink/food you order after the cruise?
  Oysters

- Do you badly miss anything from at home?
  My soft and cosy pillow
- Complete the sentence: at 3.30 a.m. ...
  our ship passed through the Kara Strait while I was sleeping

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Les gens sont occupés et enthousiaste
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Pas encore
- Quel a été votre repas favoris?
  Les biscuits au chocolat "Kremenkoulskoié" et le melon
- Quelle denrée manquera en premier?
  Les biscuits au chocolat "Kremenkoulskoié", je suis aussi inquiète pour le papier de toilette ...
- Quelle est votre meilleure/pire découverte à bord?
  Meilleure: les biscuits au chocolat; pire : les moustiques dans notre cabines
- Est-ce qu'il y à une place à bord que vous évitez?
  La cale, c'est très sombre
- Vous avez eu une discussion intéressante avec ...
  Yaroslav, a propos de l'utilisation des foraminifères comme objets d'art
- Quel élément naturel vous a le plus impressionné?
  Le coucher de soleil
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Huitres
- Est-ce que vous vous ennuyez de quelque chose?
  Mon confortable coussin
- Complétez la phrase: à 3:30 du matin…
  Le navire passait la porte de Kara pendant que je dormais

30. August 2013: Ekaterina Abramova

Tagesbericht	Daily report	Résumé de la journée
Wir sind in der Arktis. Wir haben nahezu alles gemacht, was möglich war. Eines ist sicher: Wir haben den ganzen Tag in der Karasee verbracht. Das Meer ist nahezu ruhig, der Himmel nahezu blau. Im Moment ist das Wetter auf unserer Seite.	We are in the Arctic. We have done almost everything that could be done. One thing is for sure: we've spent the whole day in the Kara Sea. The sea is almost calm, the sky is almost blue, for the present the weather is on our side.	Aujourd'hui, nous sommes dans l'Arctique, dans la mer de Kara. Nous avons fait plein de chose, la météo était de notre coté.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Optimistisch
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Wie immer haben wir mehr Fragen als Antworten
- Welches Essen hat Dir bisher am besten gefallen?
  Gemüse und Fisch
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Das Bier natürlich
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Zu wenig Platz im Labor; es gibt keinen Billardtisch und keinen Swimmingpool
- Welche Bereiche an Bord meidest Du unbedingt?
  Das könnte der Maschinenraum sein; dort ist es zu heiß und laut
- Eine interessante Unterhaltung hattest Du mit ...
  Jens über die Eisfront (frontal zone)
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Die Frühlingsflut der Lena
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Das ist nicht so wichtig für mich
- Was vermisst Du von zu Hause am meisten?
  Die Möglichkeit, auf festem Boden zu laufen

>> Mood barometer <<

- What is the general mood on board?
  Optimistic
- Are you content with the samples/data you have obtained?
  As usual we still have more questions than answers
- What kind of food is your favorite on board?

Vegetables and fish

- Your opinion: What will be used up first?
  Beer, of course
- What is your most amazing/worst discovery on board?
  Not enough private space in the laboratory; the absence of billiards and swimming pool
- Is there any place on the ship you prefer not to visit?
  That might be the machine room; it's too hot and noisy
- You had an interesting talk with ...
  Jens about frontal zones
- What was the most exciting weather/nature phenomenon so far?
  Spring flood of the Lena River
- What will be the first drink/food you order after the cruise?
  I don't particularly care
- Do you badly miss anything from at home?
  To feel my feet on solid ground

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Optimiste
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Nous avons plus de questions que de réponses
- Quel a été votre repas favoris?
  Les légumes et le poisson
- Quelle denrée manquera en premier?
  La bière bien entendue
- Quelle est votre meilleure/pire découverte à bord?
  Pas d'espace dans le labo, pas de billard, pas de piscine
- Est-ce qu'il y à une place à bord que vous évitez?
  La machinerie, c'est bruyant et trop chaud
- Vous avez eu une discussion intéressante avec ...
  Jens à propos des zones frontales dans la mer de Laptev
- Quel élément naturel vous a le plus impressionné?
  La crue de la Lena
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Ce n'est pas important
- Est-ce que vous vous ennuyez de quelque chose?
  Marcher

31. August 2013: Elena Dobrotina

Tagesbericht	Daily report	Résumé de la journée
Wir befinden uns kurz vor der Wilkizkistraße in der Karasee. Alle Geräte sind einsatzfähig. Das Wetter ist sehr stürmisch.	We are near the Vilkitsky Strait now, and we have prepared everything for work. The weather is rather well, but it could be better.	Aujourd'hui, nous sommes proche du détroit de Vilkitskiï, nous devons nous préparer à travailler. La météo est bien, mais pourrait être mieux.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Erwartungsvoll
- Welches Essen hat Dir bisher am besten gefallen?
  Tomatensaft, eingelegte Gurken und Melone
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Bier
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Die Türhalter, die nicht richtig schließen, und wenig kaltes Wasser
- Welche Bereiche an Bord meidest Du unbedingt?
  Den Maschinenraum; dort ist es laut, heiß und eng
- Eine interessante Unterhaltung hattest Du mit ...
  dem ersten Offizier über verschiedene Expeditionen in die Arktis
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Ein doppelter Regenbogen
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Cappuccino
- Was vermisst Du von zu Hause am meisten?
  Unterlage für das MQ-System (Anm. d. Red.: Aha)
- Vervollständige den Satz: Nachts um halb drei ...
  wollte ich ohne Warteschlange eine Dusche nehmen; leider war das Wasser sehr kalt

>> Mood barometer <<

- What is the general mood on board?
  Expectant
- What kind of food is your favorite on board?
  Tomato juice, pickled cucumbers and melon
- Your opinion: What will be used up first?
  Beer
- What is your most amazing/worst discovery on board?

Idle door holders and feeble stream of cold water from the tap

- Is there any place on the ship you prefer not to visit?
  Yes, it is the engine room! There it is stuffy, hot and loud
- You had an interesting talk with ...
  with the chief mate about various voyages in the Arctic seas
- What was the most exciting weather/nature phenomenon so far?
  Double rainbow
- What will be the first drink/food you order after the cruise?
  Cappuccino
- Do you badly miss anything from at home?
  A drip pan for the MQ-system
- Complete the sentence: at 3.30 a.m. ...
  I wanted to shower without having to wait in a queue but the water was very cold ...

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  En attente
- Quel a été votre repas favoris?
  Le jus de tomate, les pickles et le melon
- Quelle denrée manquera en premier?
  Bière
- Quelle est votre meilleure/pire découverte à bord?
  Les attaches pour les portes qui ne tiennent pas et l'absence sporadique d'eau froide
- Est-ce qu'il y à une place à bord que vous évitez?
  La machinerie, c'est bruyant, chaud et encombré
- Vous avez eu une discussion intéressante avec ...
  un officier, sur ses nombreux voyages en Arctique
- Quel élément naturel vous a le plus impressionné?
  Un double arc-en-ciel
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Cappuccino
- Est-ce que vous vous ennuyez de quelque chose?
  Mon système anti-goute pour l'eau milli-Q
- Complétez la phrase: à 3:30 du matin ...
  j'allais prendre une douche sans concurrence, mais l'eau était trop froide

1. September 2013: Jens Hölemann

Tagesbericht	Daily report	Résumé de la journée
Mit frischem Wind von achtern fahren wir auf die Wilkizkistraße – die Meerenge zwischen der Karasee und der Laptewsee – zu. Ab und zu reißt der graue Himmel auf und die Sonne kommt zum Vorschein. Die neuesten Eiskarten zeigen, dass in der östlichen Karasee immer noch große Eisfelder liegen. Wir werden uns daher einem Konvoi anschließen, der von einem Eisbrecher angeführt wird. Eigentlich sind wir bereit für die erste Messstation – wenn es nur endlich soweit wäre!	With a fresh breeze from behind we are sailing toward the Vilkitskiy Strait – the passage from the Kara to the Laptev Sea. Every now and then the grey clouds break up and we get a glimpse of the sun. The latest ice maps show that there are still large ice fields in the eastern Kara Sea. Therefore, we are going to join a convoy led by an icebreaker. We are rather looking forward to our first station!	Avec les vents froids de dos, nous naviguons vers le détroit de Vilkitskiï, le passage entre la mer de Kara et de Laptev. De temps en temps le ciel gris s'éclaircit et le soleil montre son visage. La nouvelle carte des glaces montre qu'il y a toujours beaucoup de glace dans l'est de la mer de Kara. Nous devrons donc joindre un convoi de navire qui sera guidé par un brise-glace. Nous sommes prêts pour la première station.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Bestens!
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Daten? Welche Daten?
- Welches Essen hat Dir bisher am besten gefallen?
  Öhm?... der Tomaten-Gurken-Salat und die Suppen, die es jeden Tag zum Mittag gibt
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Ich befürchte, dass es die Tomaten und Gurken sein werden
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Die tollste Entdeckung war, dass wir tatsächlich alle Kabel für unsere Messgeräte mit an Bord haben
- Welche Bereiche an Bord meidest Du unbedingt?
  Den Platz neben den Lüftungsschächten auf dem zweiten Deck. Da platzen einem die Trommelfelle
- Eine interessante Unterhaltung hattest Du mit ...
  Ich glaube ich hatte schon mehr als eine interessante Unterhaltung; vor allem Matthias hat viele schöne Geschichten auf Lager
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Da gab's bis jetzt noch nichts
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?

Soweit ist es noch nicht, dass ich von Essen an Land träume

- Was vermisst Du von zu Hause am meisten?
  Meine Familie einschließlich der Haustiere
- Vervollständige den Satz: Nachts um halb drei ...
  schlafe ich tief und fest (noch)

>> Mood barometer <<

- What is the general mood on board?
  Excellent!
- Are you content with the samples/data you have obtained?
  Data? What data?
- What kind of food is your favorite on board?
  Er ... tomato-cucumber salad and the soups we get every day for dinner
- Your opinion: What will be used up first?
  I'm afraid it will be tomatoes and cucumbers
- What is your most amazing/worst discovery on board?
  The most amazing discovery was that we do indeed have all cables for our equipment with us
- Is there any place on the ship you prefer not to visit?
  The place next to the ventilation stack on the second deck; the noise is ear-splitting
- You had an interesting talk with ...
  I think I've had more than one interesting talk; Matthias, in particular, can tell many a good story
- What was the most exciting weather/nature phenomenon so far?
  None so far
- What will be the first drink/food you order after the cruise?
  I'm not yet so desperate that I dream of eating after our return
- Do you badly miss anything from at home?
  My family including our pets
- Complete the sentence: at 3.30 a.m. ...
  I'm sound at sleep

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Au top!
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Echantillonnage? Quelle échantillonnage?
- Quel a été votre repas favoris?
  Hum, la salade de tomate-concombres et la soupe
- Quelle denrée manquera en premier?

J'ai bien peur que ca soit la salade de légumes!

- Quelle est votre meilleure/pire découverte à bord?
  Meilleure: Nous avons tous les câbles requis pour nos instruments avec nous
- Est-ce qu'il y à une place à bord que vous évitez?
  A côté de la sortie de ventilation, ca crève les tympans
- Vous avez eu une discussion intéressante avec ...
  J'en ai eu plus d'une, mais Matthias à toujours des histoires intéressantes a raconté
- Quel élément naturel vous a le plus impressionné?
  Rien à date
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Je ne suis pas encore désespéré de la nourriture ici
- Est-ce que vous vous ennuyez de quelque chose?
  Ma famille, incluant les animaux
- Complétez la phrase: à 3:30 du matin …
  je suis encore au lit

2. September 2013: Alexandr Ipatov

Tagesbericht	Daily report	Résumé de la journée
Heute ist ein sehr erfolgreicher Tag, denn wir haben sowohl den Wasserkranzschöpfer als auch den Multicorer getestet und beide funktionieren einwandfrei.	Today was a very successful day as we tested the rosette and the multicorer and both functioned very well.	Aujourd'hui fût une excellente journée. Nous avons réussi à tester la rosette et le multicorer, les deux ont très bien fonctionnés.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Bereit zum Arbeiten: Heute hat sich gezeigt, dass die Schiffsmannschaft ebenfalls gut vorbereitet ist. Unsere Geräte funktionieren gut
- Welches Essen hat Dir bisher am besten gefallen?
  Mir schmeckt alles, wenn ich hungrig bin
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Die Zeit zum Arbeiten, denn wir haben nur ein begrenztes Zeitfenster dafür
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Tollste Entdeckung: das Köche-Team an Bord, schrecklichste Entdeckung: schlechte Duschen
- Welche Bereiche an Bord meidest Du unbedingt?

Das Deck bei Wind und Regen

- Eine interessante Unterhaltung hattest Du mit ...
  mit dem Kapitän: Wir haben vor 27 und 25 Jahren zusammen auf einem Schiff gearbeitet
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Doppelter Regenbogen und grüner Bogen
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Darüber denke ich nie nach
- Was vermisst Du von zu Hause am meisten?
  Nur meine Liebe
- Vervollständige den Satz: Nachts um halb drei ...
  schlafe ich weiter

>> Mood barometer <<

- What is the general mood on board?
  We are all ready for work: Today the crew proved to be well prepared, too. Our equipment works well
- What kind of food is your favorite on board?
  Any food when I'm hungry
- Your opinion: What will be used up first?
  Time for working; it is very limited
- What is your most amazing/worst discovery on board?
  Most amazing: the ship's cooks; worst: badly working showers
- Is there any place on the ship you prefer not to visit?
  The deck in wind and rain
- You had an interesting talk with ...
  with the captain – we worked together on a vessel 27 and 25 years ago
- What was the most exciting weather/nature phenomenon so far?
  A double rainbow and green ray
- What will be the first drink/food you order after the cruise?
  I never think about something like that
- Do you badly miss anything from at home?
  Only my loved one
- Complete the sentence: at 3.30 a.m. ...
  I continue to sleep

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Tout le monde est prêt à travailler, autant l'équipage scientifique que technique

- Quel a été votre repas favoris?
  N'importe quoi quand j'ai faim
- Quelle denrée manquera en premier?
  Le temps alloué pour travailler
- Quelle est votre meilleure/pire découverte à bord?
  Meilleure: la cuisine; pire: mauvaise qualité des douches
- Est-ce qu'il y à une place à bord que vous évitez?
  Sur le pont quand il vente et il pleut
- Vous avez eu une discussion intéressante avec ...
  le capitaine, nous avons travaillé sur le même navire il y a 27 et 25 ans
- Quel élément naturel vous a le plus impressionné?
  Le double arc-en-ciel et les aurores boréales
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Je n'y pense jamais
- Est-ce que vous vous ennuyez de quelque chose?
  Seulement mon cœur
- Complétez la phrase: à 3:30 du matin …
  je continu à dormir

3. September 2013

Moin zusammen,

heute sollte ein spannender Tag werden, da unser Schiff für den Eisbrecher-Konvoi gelistet sein sollte, aber die Informationen in diesen Breiten können sehr dynamisch sein und oftmals abhängig vom Wetter oder anderen Dingen, von denen wir nichts verstehen. Noch dazu gab es Feierlichkeiten zu vermelden, da unser lieber Kollege Jens wie letztes Jahr, das Jahr davor und sowieso die meisten Jahre am 3. September seinen Geburtstag feiert. So fragte er dann auch schon gleich beim Frühstück nach seinem Geschenk, dem Eisbrecher versteht sich. Und dann, fast schon ein bisschen unglaublich, tauchte die YAMAL pünktlich um 8 Uhr morgens am Horizont auf. Die YAMAL ist eines der charismatischsten Schiffe, die man sich vorstellen kann, komplett in schwarz und rot, mit Haifischzähnen an den Bug gemalt. Der Eisbrecher strotzt vor Kraft und zieht eine Aura nach sich, die das Eis ganz von alleine auseinandergehen lässt. Naja gut ... Es sollte also tatsächlich losgehen, und so bildete sich ein Konvoi von insgesamt 5 Schiffen, angeführt von der YAMAL, und seitdem haben wir immer etwas zu gucken. Zwischenzeitlich kam mal die Hiobsbotschaft, dass der Konvoi gestoppt werden sollte, weil der Eisbrecher anderweitig zu Hilfe kommen müsse. Das Problem hat sich aber glücklicherweise nach einer halben Stunde aufgelöst und so ging es dann weiter und endgültig nach Nordost in Richtung Wilkizkistraße.

Die Eisbedingungen bislang sind für YAMAL natürlich ein Kinderspiel, könnten bei ungünstigen Winden allerdings schnell zu einem Problem für die anderen Schiffe im Konvoi werden. Von daher fühlen wir uns alle hier so richtig gut aufgehoben und freuen uns über die Stille, die diese Eislandschaft ausstrahlt. Zwischendurch werden Seehunde gesichtet, aber leider auch Farbeimer oder sonstiger Müll von einem der vorderen Schiffe. Das Müllproblem

auf den Ozeanen hört also in der Arktis nicht auf. Nachdem wir mittlerweile bestens vorbereitet sind für die Arbeiten der ersten Stationen und Verankerungen, gab es dann am Abend eine kleine Geburtstagsfeier in der Messe zu Jensens Ehren. Da bleibt es müssig zu erwähnen, dass viele Plätze beim Frühstück unbesetzt blieben, aber auch das gehört zu einer Expedition dazu.

Zur Zeit ist die Reisegeschwindigkeit nicht mehr als 4 Knoten, und wir bleiben gespannt wie sich die Eissituation weiter entwickelt und wann die Forschung dann so richtig losgehen kann. In diesem Sinne, Schiff ahoi!

3. September 2013: Markus Janout

Tagesbericht	Daily report	Résumé de la journée
Wir haben den Eisbrecher YAMAL getroffen, eines der charismatischsten Schiffe überhaupt, und folgen ihm nun durch das Eis. Und natürlich haben wir auch Jens' Geburtstag gefeiert.	We met the icebreaker YAMAL, one of the most charismatic vessels in the world, and now we are following it through the ice. In addition, we celebrated Jens's birthday.	Nous avons rencontré le brise-glace YAMAL, un des navires les plus charismatiques au monde, et nous le suivons depuis ce temps à travers des glaces. De plus, nous avons fêté l'anniversaire de Jens.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Ganz gut trotz des Bierproblems
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Nicht wirklich, aber das kommt schon noch. Wir haben ja noch gar nicht angefangen
- Welches Essen hat Dir bisher am besten gefallen?
  Der Mohnkuchen war grandios
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Mexikanski (Anm. d. Red.: Es handelt sich um einen sehr beliebten Ketchup)
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Die tollste Entdeckung war, dass wir tatsächlich genügend Platz fanden, um alle unsere Geräte und Kisten zu verstauen
- Welche Bereiche an Bord meidest Du unbedingt?
  Die Frauentoiletten
- Eine interessante Unterhaltung hattest Du mit ...
  Das kommt bestimmt noch
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Die Eislandschaft
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Nudeln mit Mexikanski-Sauce

- Was vermisst Du von zu Hause am meisten?
  Meine Familie
- Vervollständige den Satz: Nachts um halb drei ...
  gibt es immer noch einen, der den Dampfer steuert

Zusatzfragen:

- Wie lautet Dein Spruch des Tages?
  Wenn alle, dann alle
- Vision?
  Laut Dr. Stöchert 100%

>> Mood barometer <<

- What is the general mood on board?
  Okay in spite of the beer problem
- Are you content with the samples/data you have obtained?
  Not really, but I'm sure that will change. After all we haven't even got started yet
- What kind of food is your favorite on board?
  The poppy-seed cake was absolutely wonderful
- Your opinion: What will be used up first?
  Mexikansky ketchup
- What is your most amazing/worst discovery on board?
  The most amazing discovery was that we indeed found enough space to store all our equipment and boxes
- Is there any place on the ship you prefer not to visit?
  The ladies' toilet
- You had an interesting talk with ...
  I'm looking forward to having one
- What was the most exciting weather/nature phenomenon so far?
  The ice landscape
- What will be the first drink/food you order after the cruise?
  Pasta with Mexikansky ketchup
- Do you badly miss anything from at home?
  My family
- Complete the sentence: at 3.30 a.m. ...
  there is yet someone at the steering wheel

Additional questions:

- Today's motto
  If all, then all indeed

- Vision?
  Dr. Stöchert attested 100%

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Plutôt bien mis à part le manque de bière
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Pas vraiment, mais ça devrait venir
- Quel a été votre repas favoris?
  Le pain au pavot était excellent
- Quelle denrée manquera en premier?
  Mexicanskiï ketchup
- Quelle est votre meilleure/pire découverte à bord?
  Meilleure: Nous avons assez de place sur le bateau pour accommoder tout notre équipement
- Est-ce qu'il y à une place à bord que vous évitez?
  La toilette des femmes
- Vous avez eu une discussion intéressante avec ...
  À venir, j'espère
- Quel élément naturel vous a le plus impressionné?
  La glace de mer
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Nouilles avec Mexicanskiï ketchup
- Est-ce que vous vous ennuyez de quelque chose?
  Ma famille
- Complétez la phrase: à 3:30 du matin …
  il y a quelqu'un pour diriger le bateau

Questions supplémentaires

- Le mot du jour?
  Quand c'est parti c'est parti
- Vision?
  Selon le Dr. Stöchert: 100%

4. September 2013: Bennet Juhls

Tagesbericht	Daily report	Résumé de la journée
Wir sind heute noch immer in der Karasee kurz vor der Wilkizkistraße und bahnen uns zusammen mit drei anderen Schiffen und dem Eisbrecher YAMAL den Weg durch das Eis. Direkt am Morgen gab sich dann auch der erste Eisbär, faulenzend in der Sonne liegend, die Ehre, uns im Eis willkommen zu heißen.	Today we are still in the Kara Sea not far from the Vilkitsky Strait and are traversing the ice together with 3 other vessels and the icebreaker YAMAL. This morning we were honored by our first polar bear who seemed to welcome us, bathing lazily in the sun.	Nous sommes aujourd'hui encore dans la mer de Kara et avec 3 autres navires et l'aide de YAMAL nous avançons au travers de la glace. Au petit matin nous avons aperçus notre 1er ours polaire qui semblait nous souhaiter la bienvenue dans l'Arctique.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?

  Am heutigen Tag etwas erschöpft nach einem etwas längeren Abend (Geburtstag von Jens). Nach Sichtung insgesamt zweier Eisbären und vieler Robben aber schnell wieder sehr gut!

- Welches Essen hat Dir bisher am besten gefallen?

  Ausnahmslos alles sehr, sehr lecker, weshalb das mit der angestrebten Diät wohl leider nichts wird

- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?

  Da einige Früchte und Obst nach 3- bis 4-tägiger Abstinenz doch plötzlich wieder auftauchen, wie etwa die schon für längst verbraucht geglaubten Tomaten, ist es wirklich schwer zu sagen. Allerdings neigt sich aus fast jedem Wasserhahn nach etwa einer Minute das kalte Wasser dem Ende zu

- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?

  Tollste Entdeckung: Dass jeden Tag ein neues Nutellaglas auf jedem Tisch steht; schrecklichste Entdeckung: Dass dieses Nutellaglas täglich auf jedem Tisch geleert wird ...

- Welche Bereiche an Bord meidest Du unbedingt?

  Den Platz an der Kaffeemaschine, da man sonst die Aufgabe bekommt, eine halbe Stunde die Kaffeemaschine zu bewachen, damit sie nicht überläuft. Merke: An guten Kaffeefiltern sollte man nicht sparen!

- Eine interessante Unterhaltung hattest Du mit ...

  dem Bootsjungen Andrej über seine Argumente, warum er jedesmal, wenn ich mich kurz hinlegen möchte, in unserer Kammer staubsaugen will

- Was war bisher das aufregendste Wetter/Naturphänomen?

  Naja, Eisschollen gucken ist immer toll und davon gibt es im Moment genug!

- Welches Getränk/Essen bestellt Du Dir zuerst an Land?

  Eine Suppe von dem Koch der VIKTOR BUYNITSKIY, da könnt' man sich wirklich reinsetzen, lecker, lecker

- Was vermisst Du von zu Hause am meisten?

  Na was wohl 
- Vervollständige den Satz: Nachts um halb drei ...

  kann man den Kriegsfilmen lauschen, die rund um die Uhr in der Rauchermesse laufen
- Wie lautet Dein Spruch des Tages?

  Guck mal, der braune Fleck hebt gerade seinen Kopf – Ohhhh, es ist ein Eisbär

>> Mood barometer <<

- What is the general mood on board?

  Today we are a little tired after Jens' birthday party last night
- What kind of food is your favorite on board?

  All food is absolutely delicious and I'm afraid I won't lose weight as I planned to do
- Your opinion: What will be used up first?

  Since every now and then fruits or vegetables we didn't get for 3 or 4 days re-emerge from the kitchen, as for instance tomatoes, which we thought to have run out, I can't really say. Cold water from the tap, however, is always short
- What is your most amazing/worst discovery on board?

  Most amazing: every day there is a new Nutella jar on every table; worst: every day the Nutella jars are emptied ...
- Is there any place on the ship you prefer not to visit?

  The place next to the coffee machine because there you run the risk of being ordered to have a look at the machine for the next half-hour to prevent it from spilling. Note: never be stingy with coffee filters!
- You had an interesting talk with ...

  cabin boy Andrey on his reasons for the fact that he wants to vacuum-clean our cabin every time I want to take a nap
- What was the most exciting weather/nature phenomenon so far?

  Why, to watch ice floes is always great and there are lots of them right now!
- What will be the first drink/food you order after the cruise?

  One of the ship's cook's soups, they are ever so delicious
- Do you badly miss anything from at home?

  Guess what
- Complete the sentence: at 3.30 a.m. ...

  you can listen to the war movies that are shown in the smokers' mess room day and night
- Today's motto

  Oh look, that brown blotch is lifting its head – oops, it's a polar bear

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?

Nous sommes un peu fatigué après la fête pour Jens hier soir/nuit. Mais après avoir vu les 2 ours polaires et les nombreux phoques nous sommes revigoré

- Quel a été votre repas favoris?

  Tout, sans exception, est bon. Je ne crois pas perdre de poids cette fois-ci
- Quelle denrée manquera en premier?

  C'est difficile à dire pour les aliments, mais une chose est sure, l'eau froide disparait rapidement dans la douche
- Quelle est votre meilleure/pire découverte à bord?

  Meilleure: À chaque jour, il y a un nouveau pot de Nutella sur la table. Pire: Le pot de Nutella se re-vide rapidement
- Est-ce qu'il y à une place à bord que vous évitez?

  La place a coté de la machine à café, car il faut la surveiller pour éviter les débordements à cause de la mauvaise qualité des filtres
- Vous avez eu une discussion intéressante avec ...

  le matelot qui s'occupe du ménage des chambres, à savoir pourquoi il veut toujours faire le ménage de ma chambre quand je veux dormir
- Quel élément naturel vous a le plus impressionné?

  Regarder la glace de mer est toujours merveilleux et pour le moment il n'en manque pas
- Quelle sera le premier aliment que vous allez demander une fois à terre?

  La soupe est délicieuse
- Est-ce que vous vous ennuyez de quelque chose?

  Devinez
- Complétez la phrase: à 3:30 du matin …

  on peu écouter les films de guerre dans la salle enfumée des matelots
- Le mot du jour?

  Regarde la chose brune qui s'élève…oh c'est un ours polaire

6. September 2013

Polarforschung vom Feinsten

Gestern haben wir mit unseren Forschungsarbeiten in der südwestlichen Laptewsee begonnen. Wir arbeiten entlang eines von Süden nach Norden verlaufenden Profils und heute Mittag haben wir bei unserer dritten Station die Eisgrenze erreicht. Die Stationsarbeiten laufen fast ohne Probleme und wir haben bereits viele Wasser- und Sedimentproben genommen. Zur Zeit befinden wir uns auf dem Weg zu unserer ersten 24-Stunden-Position, wo wir unter anderem das Meeresobservatorium VILKITSKY ausbringen werden.

Gutes Wetter, neugierig ans Schiff schwimmende Eisbären und vorbeitreibende Eisberge begleiten unsere Forschungsarbeiten an der Eisgrenze.

Viele Grüße von Bord,

Heidi Kassens im Namen der Expeditionsteilnehmer

6. September 2013: Sergei Korsun

Tagesbericht	Daily report	Résumé de la journée
Nordwestliche Laptewsee. Zwei Stationen haben wir heute geschafft. Nebel an der Eisgrenze.	Northwestern Laptev Sea. Carried out two stations. Fog at the ice edge.	Nous avons fait deux stations dans le nord ouest de la mer de Laptev.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Die Geräte funktionieren besser, als wir annahmen, aber schlechter, als wir hofften
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Das werde ich, wenn die Probennahme so erfolgreich weitergeht wie bisher
- Welches Essen hat Dir bisher am besten gefallen?
  Seeanemonen mit Sauce von *Calanus hyperboreus*
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  500-ml-Probenflaschen (Anm. d. Red.: Davon gibt es noch genügend)
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Schrecklichste Entdeckung: Es gibt keine 250-ml-Flaschen
- Welche Bereiche an Bord meidest Du unbedingt?
  Diese Bereiche muss ich noch finden
- Eine interessante Unterhaltung hattest Du mit ...
  der Expeditionsleiterin über submarinen Permafrost
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Doppelter Regenbogen
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Das hängt davon ab, was es in den Lebensmittelläden in Tiksi gibt
- Was vermisst Du von zu Hause am meisten?
  250-ml-Probenflaschen
- Vervollständige den Satz: Nachts um halb drei ...
  waren wir mit Station 2 fertig
- Wie lautet Dein Spruch des Tages?
  Shit happens
- Vision?
  Zwischen-Gezeiten-Beprobung

>> Mood barometer <<

- What is the general mood on board?
  The equipment works better than we anticipated, but worse than we hoped
- Are you content with the samples/data you have obtained?

I will if the sampling goes on with as much success

- What kind of food is your favorite on board?
  Sea anemones with sauce of *Calanus hyperboreus*
- Your opinion: What will be used up first?
  500 ml sampling bottles
- What is your most amazing/worst discovery on board?
  Worst: there are no 250 ml sampling bottles
- Is there any place on the ship you prefer not to visit?
  Yet to be discovered
- You had an interesting talk with ...
  the chief scientist about submarine permafrost
- What was the most exciting weather/nature phenomenon so far?
  Double rainbow
- What will be the first drink/food you order after the cruise?
  Depends on what is available in the food shops in the town of Tiksi
- Do you badly miss anything from at home?
  250 ml sampling bottles
- Complete the sentence: at 3.30 a.m. ...
  we were through with station 2
- Today's motto
  Shit happens
- Vision?
  Intertidal sampling

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  L'équipement fonctionne mieux que ce que l'on pensait, mais moins bien qu'on ne l'espérait
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Je le serai si ça continu
- Quel a été votre repas favoris?
  Des anémones de mer avec de la sauce *Calanus hyperboreus*
- Quelle denrée manquera en premier?
  Des bouteilles de 500 mL pour l'échantillonnage
- Quelle est votre meilleure/pire découverte à bord?
  Pire: il n'y a pas de bouteilles de 250 mL
- Est-ce qu'il y à une place à bord que vous évitez?
  Ça reste à découvrir
- Vous avez eu une discussion intéressante avec ...
  le Chef scientifique à propos du permafrost sous-marin
- Quel élément naturel vous a le plus impressionné?

L'arc-en-ciel double

- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Ça dependra de ce qu'il y aura à Tiksi ...
- Est-ce que vous vous ennuyez de quelque chose?
  Des bouteilles de 250 mL
- Complétez la phrase: à 3:30 du matin …
  nous finissions la station 2
- Le mot du jour?
  Shit happens
- Vision?
  Echantionnage de la yone intertidale

7. September 2013: Irina Kryukova

Tagesbericht	Daily report	Résumé de la journée
Den ganzen Tag haben wir auf der Station VILKITSKY verbracht, unserer ersten großen Station. Wir haben auf besseres Wetter gewartet, da es doch sehr windig war. Schließlich wurde die See ruhiger und wir konnten unser erstes Meeresobservatorium absetzen, mit dem Multicorer Sedimentproben nehmen, vier Rosetten-Einsätze für Wasserproben fahren und Netze ins Wasser werfen. Gut gemacht!	The whole day we spent at station VILKITSKY, our first major station. We waited for better weather because it was quite windy. Finally the sea became calmer and we managed to deploy the first seafloor observatory, take multicorer samples, make four rosette casts for water sampling and take net samples. Well done!	Nous avons passé la journée à VILKITSKY, notre première grosse station. Nous avons dû attendre pour de meilleure condition météo car le vent soufflait très fort. Nous avons finalement pus commencer notre travail: deploiement des mouillages, multi-carottier et 4 rosettes pour recolter de l'eau. Bien joué!

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Die ändert sich von „schläfrig“ zwischen den Stationen zu „dynamisch“ während der Arbeit
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Ja
- Welches Essen hat Dir bisher am besten gefallen?
  Mohnkuchen
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?

Nutella

- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Schrecklichste Entdeckung: Selbst nach zwei Wochen auf dem Schiff fühle ich mich seekrank
- Welche Bereiche an Bord meidest Du unbedingt?
  Maschinenraum (zu laut)
- Eine interessante Unterhaltung hattest Du mit ...
  dem Bootsmann über die Geschichte unseres Schiffes
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Eisbären
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Definitiv werden es weder Nudeln noch ein Fleischgericht sein
- Was vermisst Du von zu Hause am meisten?
  Manchmal das Internet
- Vervollständige den Satz: Nachts um halb drei ...
  haben einige von uns geschlafen, während andere gearbeitet haben

>> Mood barometer <<

- What is the general mood on board?
  It changes from sleepy between stations to very dynamic during work
- Are you content with the samples/data you have obtained?
  Yes
- What kind of food is your favorite on board?
  Poppy-seed cake
- Your opinion: What will be used up first?
  Nutella
- What is your most amazing/worst discovery on board?
  Worst discovery: even after two weeks on board you feel seasick
- Is there any place on the ship you prefer not to visit?
  Engine room (too noisy)
- You had an interesting talk with ...
  the boatman about history of our ship
- What was the most exciting weather/nature phenomenon so far?
  Polar bears
- What will be the first drink/food you order after the cruise?
  Definitely it will be neither pasta nor any meat dish
- Do you badly miss anything from at home?
  The internet, sometimes
- Complete the sentence: at 3.30 a.m. ...
  some of us were sleeping while others worked

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Ça change entre endormie entre les stations et très dynamique pendant les stations
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Oui
- Quel a été votre repas favoris?
  Le pain au pavot
- Quelle denrée manquera en premier?
  Nutella
- Quelle est votre meilleure/pire découverte à bord?
  Pire: même après 2 semaines, j'ai le mal de mer
- Est-ce qu'il y à une place à bord que vous évitez?
  La salle des machines (trop de bruit)
- Vous avez eu une discussion intéressante avec ...
  l'officier de pont, sur l'histoire de notre navire
- Quel élément naturel vous a le plus impressionné?
  Ours polaires
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Je ne commenderai sûrement pas de macaroni ou de viande en tout cas!
- Est-ce que vous vous ennuyez de quelque chose?
  Internet, quelques fois
- Complétez la phrase: à 3:30 du matin …
  quelqu'un d'entre nous dormions pendant que d'autres travaillaient

8. September 2013: Georgi Laukert

Tagesbericht	Daily report	Résumé de la journée
Wann fängt ein Tag an und wann endet er? Diese Frage ist nicht mehr ganz so einfach zu beantworten. Die Uhren an Bord laufen zwar nach Moskauer Zeit, diese scheint aber nur noch für die Essenszeiten von Bedeutung zu sein. Die Sonne zumindest richtet sich schon lange nicht mehr danach, was durch Sonnenaufgänge gegen Mitternacht belegt werden kann. Aber auch wir haben begonnen, unseren Tagesablauf zunehmend nach den Stationen zu richten, die wir abfahren. So entwickelt gerade jeder an Bord seinen eigenen Rhythmus, auch wenn das bedeutet, morgens schlafen zu gehen und abends Mittag zu essen. Wissenschaft bedeutet manchmal eben auch, seine eigenen Bedürfnisse nach hinten zu stellen. Es gibt aber keinen hier an Bord, der nicht gerne Wissenschaftler ist. Heute haben wir versucht, ein älteres Meeresobservatorium an Bord zu holen. Leider vergebens. Die POLARSTERN hatte es letztes Jahr auch schon versucht. Das Wetter ist momentan eher unspektakulär. Kieler würden es in dieser Form wahrscheinlich als „normal“ bezeichnen, in Süddeutschland würde man vermutlich „schlecht“ dazu sagen. Aber ums Wetter drehen sich momentan die wenigsten Gespräche.	When does the day begin and when does it end? It isn't easy to answer this question. We use Moscow time but this seems to be of importance only for meals. The sun at least doesn't care, rising at midnight. We have meanwhile adapted to the rythm of our stations and this means for one or the other to go to bed in the morning and to have lunch in the evening. After all, to be a scientist sometimes requires you to make sacrifices, and we are all ready to do so. Today we unsuccessfully tried to recover a seafloor observatory which POLARSTERN already tried to recover last year. The weather is rather dull right now. In Kiel we would consider it "normal" weather, people from the south of Germany, however, would call it bad weather. But we are hardly ever talking about the weather these days.	Quand le jour commence t'il? Quand fini t'il? Cette question n'est pas facile a répondre, nous travaillons sur l'heure de Moscou malgré le fait que même le soleil ne suit pas ce rythme. Nous avons commencé à prendre notre rythme, donc certain d'entre nous déjeune le soir et d'autre soupe le matin. Il faut faire des sacrifices pour suivre la cadence mais personne ici ne changerai de place car ce qu'on fait est unique. Aujourd'hui nous n'avons pas reussi a récupéré notre mouillage, une 2e tentative rates après celle de POLARSTERN l'an dernier. La météo n'est pas spectaculaire, on dirait Kiel, donc plutôt normale pour nous mais les gens du Sud ne l'apprécie guère.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?

  Es können einem ziemlich verschlafene Gesichter begegnen, wenn man zum Essen erscheint oder die Gänge entlang schlendert. Der guten Grundstimmung jedoch tut dies keinen Abbruch

- Bist Du zufrieden mit der Proben-/Datenausbeute?

  Ja, das bin ich

- Welches Essen hat Dir bisher am besten gefallen?

  Ein Stück Milka-Schokolade, das mir Benoît irgendwann gestern Nacht geschenkt hat. Und heute frisch von Küchen-Team geschenkt: Eine Dose roten Kaviar für jeden!

- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?

  Auf keinen Fall die Reiselust und der Forscherdrang

- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?

  Meine tollste Entdeckung: Katya Abramova, Markus und Matthias (zugegeben, ich habe sie nicht erst auf dem Schiff entdeckt, sondern schon am Flughafen in Hamburg kennengelernt); meine schrecklichste Entdeckung: Müll, der vor meinen Augen leider über Bord geworfen wurde

- Welche Bereiche an Bord meidest Du unbedingt?

  Das Raucherzimmer. Nachdem ich einige Stunden mit Igor, dem Mechaniker, dort saß und geredet habe, tat mir danach der Kopf weh und meine Kleider rochen nach Kneipe

- Eine interessante Unterhaltung hattest Du mit ...

  dem Bootsmann, ein wirklich sehr freundlicher, weltoffener und gebildeter Mensch. Er war schon in vielen Ländern unterwegs und beherrscht einige Sprachen, und trotzdem ist er sehr bodenständig und nicht herablassend den anderen Matrosen gegenüber

- Was war bisher das aufregendste Wetter/Naturphänomen?

  Die Stille, die man gespürt hat, als das Schiff durch das Eis fuhr

- Welches Getränk/Essen bestellt Du Dir zuerst an Land?

  In Deutschland zurück werde ich mir zuerst einmal Pinienkerne kaufen und mal wieder über ein Vegetarier-Leben nachdenken, danach sehen wir weiter

- Was vermisst Du von zu Hause am meisten?

  Nichts. In der Arktis zu sein ist ein Traum

- Vervollständige den Satz: Nachts um halb drei ...

  sind die Wellen so hoch, dass niemand schlafen kann. Ich habe Glück und muss sowieso arbeiten

- Wie lautet Dein Spruch des Tages?

  Attention please: LUNCH TIME!

- Vision?

  Neulich haben wir eine Eisbärin mit ihrem Jungen direkt am Schiff vorbeischwimmen gesehen. Weit und breit war nur Wasser zu sehen und zwei weiter entfernte Eisberge. Natürlich ist einem klar, dass schwimmende Eisbären nichts Ungewöhnliches sind (die Eisgrenze war auch nicht weit entfernt), dennoch war der Anblick dieser Bären mitten auf See eher skurril. Ist das wohl das Bild des Klimawandels oder schon seit Jahrtausenden

normal? Das Eis der Arktis schmilzt jedenfalls bewiesenermaßen schneller, und das wiederum macht es den Bären nicht einfacher ...

>> Mood barometer <<

- What is the general mood on board?

  You might meet very tired faces indeed on your way to the mess room but this doesn't have the slightest effect on the positive general atmosphere
- Are you content with the samples/data you have obtained?

  Yes
- What kind of food is your favorite on board?

  The piece of Milka chocolate Benoît gave me some time last night. And today we got a tin of red caviar each from the kitchen team!
- Your opinion: What will be used up first?

  Our eagerness for traveling and research
- What is your most amazing/worst discovery on board?

  Most amazing: Markus and Matthias (well, I didn't exactly "find" them on board, but met them already at Hamburg Airport); worst: garbage thrown overboard before my very eyes
- Is there any place on the ship you prefer not to visit?

  The smoking room. After having sat there for several hours talking to the mechanic Igor, I had a terrible headache and my clothes smelled
- You had an interesting talk with ...

  the boatsman who is a very kind, open-minded and cultured man
- What was the most exciting weather/nature phenomenon so far?

  The calmness one felt when passing through the ice
- What will be the first drink/food you order after the cruise?

  Once back in Germany I will buy pine nuts and think about becoming a vegetarian, and then we'll see
- Do you badly miss anything from at home?

  Nothing. Being in the Arctic is gorgeous
- Complete the sentence: at 3.30 a.m. ...

  the waves are so high that nobody can sleep. I'm lucky as I've got to work anyhow
- Today's motto

  Attention please: LUNCH TIME!
- Vision?

  The other day we watched a female polar bear with her cub swim past the ship. There was far and wide nothing to see but water and in the far distance two icebergs. Of course, swimming polar bears aren't unusual (the ice edge wasn't far away anyway) but nevertheless it felt like a strange encounter. Has climate change to do with it? Or is it just what polar bears have used to do for thousands of years? The Arctic sea ice melts faster nowadays, that's for sure. And that won't make life easier for the bears ...

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?

  On rencontre de plus en plus de visage fatigué, mais ça ne change pas la bonne ambiance à bord
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?

  Oui
- Quel a été votre repas favoris?

  Le morceau de chocolat Milka que Benoît m'a donné hier et le cadeau de l'équipe cuisine: une conserve de caviar
- Quelle denrée manquera en premier?

  La volonté de travailler
- Quelle est votre meilleure/pire découverte à bord?

  Meilleure: Markus et Matthias; pire: Que certains dechets sont jeté a la mer
- Est-ce qu'il y à une place à bord que vous évitez?

  La salle pour fume, après avoir passé un peu de temps avec Igor, j'ai eu mal à la tête
- Vous avez eu une discussion intéressante avec ...

  l'officier de pont, un homme tres intéressant
- Quel élément naturel vous a le plus impressionné?

  Le silence lorsqu'on est entouré de glace
- Quelle sera le premier aliment que vous allez demander une fois à terre?

  Quand je serai de retour à la maison je penserai a devenir végétarien et à manger des noix
- Est-ce que vous vous ennuyez de quelque chose?

  Rien
- Complétez la phrase: à 3:30 du matin …

  les vagues étaient tellement fortes que personne n'a pus dormir, moi j'étais chanceux, je travaillais ...
- Le mot du jour?

  Votre attention: LUNCHTIME!
- Vision?

  Voir deux ours polaires nager en plein océan, sans aucune glace au environ, est une spectaculaire vision, mais troublante en même temps

9. September 2013: Fedor Martynov

Tagesbericht	Daily report	Résumé de la journée
Wir sind irgendwo in der Laptewsee und fahren die Stationen ab.	We are somewhere in the Laptev Sea working at our stations.	Nous sommes en quelque part en mer de Laptev et nous travaillons.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Alle arbeiten
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Noch nicht
- Welches Essen hat Dir bisher am besten gefallen?
  Wassermelone
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Minuten auf unserem Iridium-Telefon
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Tollste Entdeckung: Bootsmann und Kapitän; schrecklichste Entdeckung: schlechter Rauch von Plastikverbrennung
- Welche Bereiche an Bord meidest Du unbedingt?
  Keine
- Eine interessante Unterhaltung hattest Du mit ...
  Bennet über das Leben
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Baby-Eisbär, der unseren Weg gekreuzt hat
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Keine Ahnung. Ist das wichtig?
- Was vermisst Du von zu Hause am meisten?
  Meine Frau
- Vervollständige den Satz: Nachts um halb drei ...
  schreibe ich diese Zeilen
- Wie lautet Dein Spruch des Tages?
  Tu, was du kannst, und lass es laufen

>> Mood barometer <<

- What is the general mood on board?
  Working
- Are you content with the samples/data you have obtained?
  Not yet
- What kind of food is your favorite on board?
  Water melon
- Your opinion: What will be used up first?
  The purchased minutes for our Iridium phone
- What is your most amazing/worst discovery on board?
  Most amazing: boatsman and captain; worst: bad smell from burning of plastic waste
- Is there any place on the ship you prefer not to visit?
  No

- You had an interesting talk with ...
  Bennet about life
- What was the most exciting weather/nature phenomenon so far?
  Baby polar bear crossing our pathway
- What will be the first drink/food you order after the cruise?
  Dunno. Does it matter?
- Do you badly miss anything from at home?
  My wife
- Complete the sentence: at 3.30 a.m. ...
  I am completing this form
- Today's motto
  Do what you can and let it be

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Travaille
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Pas encore
- Quel a été votre repas favoris?
  Le melon d'eau
- Quelle denrée manquera en premier?
  Le temps sur la carte SIM iridium
- Quelle est votre meilleure/pire découverte à bord?
  Meilleur: le capitaine et l'officier de pont; pire: l'odeur du plastique brulé
- Est-ce qu'il y à une place à bord que vous évitez?
  Non
- Vous avez eu une discussion intéressante avec ...
  Bennet à propos de la vie
- Quel élément naturel vous a le plus impressionné?
  Bébé our polaire croisant notre passage
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Je ne sais pas, est-ce que c'est important?
- Est-ce que vous vous ennuyez de quelque chose?
  Ma femme
- Complétez la phrase: à 3:30 du matin …
  je remplissais ce questionnaire
- Le mot du jour?
  Fais ce que tu peux et laisse aller

10. September 2013: Matthias Monsees

Tagesbericht	Daily report	Résumé de la journée
Wir sind immer noch in der Laptewsee, Dampfstrecken mit UCTD und Stationsarbeit wechseln sich ab. Das Wetter ist gut.	We are still in the Laptev Sea, working either with the UCTD while sailing or carrying out our stations. The weather is fine.	Nous sommes toujours dans la mer de Laptev, nous prenons des mesures avec le UCTD et travaillons sur les stations.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Gut
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Da wir bis jetzt noch keine Verankerungsaufnahme hatten, sondern nur eine missglückte Dredge-Aktion, ist die Datenausbeute noch recht gering
- Welches Essen hat Dir bisher am besten gefallen?
  Milchsuppe
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Persönlicher Freiraum
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Tollste Entdeckung: Milchsuppe; schrecklichste Entdeckung: Platzmangel
- Welche Bereiche an Bord meidest Du unbedingt?
  Den Außenbordbereich
- Eine interessante Unterhaltung hattest Du mit ...
  dem Bootsmann
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Milchsuppe
- Was vermisst Du von zu Hause am meisten?
  Milchsuppe
- Vervollständige den Satz: Nachts um halb drei ...
  sind die Wellen so hoch, dass niemand schlafen kann. Ich habe Glück und muss sowieso arbeiten

>> Mood barometer <<

- What is the general mood on board?
  Good
- Are you content with the samples/data you have obtained?
  Since we haven't yet recovered a seafloor observatory, I haven't obtained much material
- What kind of food is your favorite on board?
  Milk soup

- Your opinion: What will be used up first?
  Personal space
- What is your most amazing/worst discovery on board?
  Most amazing: milk soup; worst: shortage of space
- Is there any place on the ship you prefer not to visit?
  The outboard area
- You had an interesting talk with ...
  the boatsman
- What will be the first drink/food you order after the cruise?
  Milk soup
- Do you badly miss anything from at home?
  Milk soup

>> Baromètre de l'humeur <<

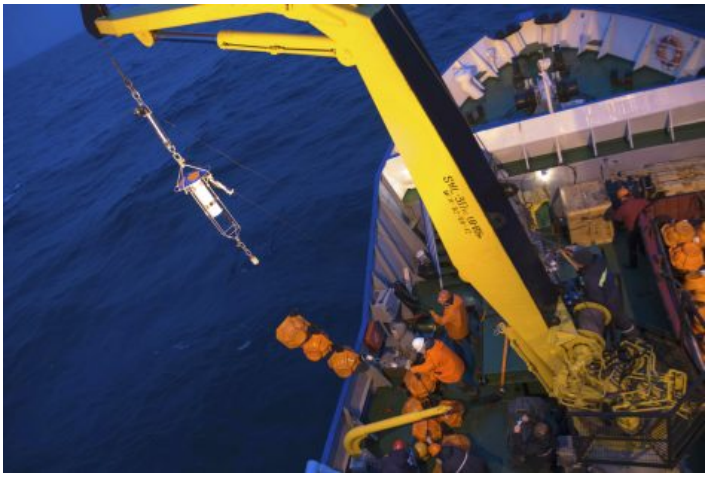
- Quel est l'atmosphère à bord du navire?
  Bon
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Comme nous n'avons pas récupéré de mouillage pour le moment, je n'ai pas de nouvelles données
- Quel a été votre repas favoris?
  La soupe au lait
- Quelle denrée manquera en premier?
  Espace personnel
- Quelle est votre meilleure/pire découverte à bord?
  Meilleur: soupe au lait; pire: pas d'espace personnel
- Est-ce qu'il y à une place à bord que vous évitez?
  par-dessus bord
- Vous avez eu une discussion intéressante avec ...
  l'officier de pont
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Soupe au lait
- Est-ce que vous vous ennuyez de quelque chose?
  Soupe au lait

11. September 2013, 75°30 N, 126°00 E

Halbzeit – Die Forschung läuft trotz stürmischer See

Die Forschungsarbeiten laufen bereits wie am Fließband und das 22-köpfige Wissenschaftlerteam hat alle Hände voll zu tun. In den letzten Tagen haben wir erfolgreich auf 12 Stationen in der westlichen Laptewsee gearbeitet und Hunderte von Gläschen mit Wasser-

und Sedimentproben gefüllt. Darüberhinaus setzen wir rund um die Uhr die sogenannte Underway-CTD ein. Mit dieser neu entwickelten Methode können während der Fahrt hochauflösende Temperatur- und Salinitätsmessungen in der Wassersäule durchgeführt werden.



Aussetzen des Meeresobservatoriums TAYMYR

Zu den bisherigen Höhepunkten gehört die Verankerung von zwei Meeresobservatorien (VILKITSKY und TAYMYR) in der nordwestlichen Laptewsee in 326 und 58 Meter Wassertiefe. Insgesamt sollen vier Meeresobservatorien verankert werden. In den bis zu 280 Meter langen Messketten verbergen sich viele Einzelkomponenten, die mit hoher Genauigkeit u.a. die Eisdicke, die Temperatur- und Leitfähigkeit, die Strömungsrichtung und Geschwindigkeit und dernSchwebstoffgehalt aufzeichnen werden. Nächstes Jahr, während der Expedition TRANSDRIFT XXII, sollen die Meeresobservatorien wieder geborgen werden und Aufschluss über die Variabilität der Umweltbedingungen in dieser Region geben. Gerade jetzt sind solche Messreihen von großer Bedeutung, denn der Klimawandel hinterlässt bereits deutliche Spuren. Wir bedauern deshalb sehr, dass es uns vor zwei Tagen nicht gelungen ist, das Meeresobservatorium OSL4 zu bergen.

Markus Janout und Matthias Monsees mit dem russischen Atomeisbrecher YAMAL

Zur Zeit befinden wir uns auf dem Weg zur dritten 24-Stunden-Station (1893) in der zentralen Laptewsee.

Herzliche Grüße aus der Laptewsee

Die Expeditionsteilnehmer

11. September 2013: Felix Müller

Tagesbericht	Daily report	Résumé de la journée
Wir bewegen uns auf dem großen Ost-West-Profil nach Osten und arbeiten dabei unterwegs mit der UCTD und an einigen kleineren Stationen. Der Himmel ist grau, die See eher ruhig.	We are moving eastward on the major east-west transect, using the UCTD, and carry ouztt some of the short-term stations. The sky is grey, the sea rather calm.	Nous naviguons plein Est sur notre grand transect en prenant des mesures UCTD et nous arrêtant pour quelques stations courtes. Le ciel est gris, mais la mer calme.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Die Stimmung ist gut, allerdings gibt es ein paar Probleme, siehe 4. Frage
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Ist das Glas halbvoll oder halb leer?
- Welches Essen hat Dir bisher am besten gefallen?
  Alle Suppen. Und der Rest, außer die Leber
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Ist längst passiert: Nutella und Mexikanski-Ketchup
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Da ist etwas Schreckliches in der Kühltruhe im Labor ...
- Welche Bereiche an Bord meidest Du unbedingt?
  Den Maschinenraum ... zu heiß und zu laut
- Eine interessante Unterhaltung hattest Du mit ...
  Benoît, über die Montreal-Canadiens und das Zuhause-Sein an einem Ort, der Tausende von Kilometern entfernt ist
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Sonnenaufgang überm Meereis in der Wilkizkistraße im Konvoi mit einem Atomeisbrecher
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Etwas von McDonalds
- Was vermisst Du von zu Hause am meisten?
  Lisa, meine Freundin
- Vervollständige den Satz: Nachts um halb drei ...
  wird man auch gerne mal für einen MUC-Einsatz geweckt
- Wie lautet Dein Spruch des Tages?
  Das können wir eh nicht ändern
- Vision?
  ... von einer Eisbärin mit Jungem, das um sein Leben schwimmt

>> Mood barometer <<

- What is the general mood on board?
  The mood is quite good though there is some trouble, see 4th question
- Are you content with the samples/data you have obtained?
  Is the glass half full or half empty?
- What kind of food is your favorite on board?
  All the soups. And all the rest, except the liver
- Your opinion: What will be used up first?
  It has already happened: Nutella and Mexikansky-Ketchup
- What is your most amazing/worst discovery on board?
  There is something horrible in the fridge in the lab ...
- Is there any place on the ship you prefer not to visit?
  The engine room ... too hot, too noisy!
- You had an interesting talk with ...
  Benoît about the Montreal Canadiens and feeling at home in a place that's thousands of kilometers away
- What was the most exciting weather/nature phenomenon so far?
  Sunrise above the sea ice of the Vilkitsky Strait while sailing in a convoi with a nuclear icebreaker
- What will be the first drink/food you order after the cruise?
  Something from McDonalds
- Do you badly miss anything from at home?
  My girlfriend Lisa
- Complete the sentence: at 3.30 a.m. ...
  somebody knocks on your door to wake you up for operating the MUC
- Today's motto
  We can't do anything about it
- Vision?
  The polar bear with its cub, swimming to survive

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Plutôt bon, mais il y a quelques problèmes (voir question numéro 4)
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Le verre est a moitié vide ... ou moitié plein?
- Quel a été votre repas favoris?
  Toutes les soupes, et le reste. .. mis à part le foie
- Quelle denrée manquera en premier?
  Trop tard, le Nutella et le Mexicanskiï-ketchup sont disparue
- Quelle est votre meilleure/pire découverte à bord?

Il y a quelque chose d'horrible dans le frigo du labo ...

- Est-ce qu'il y à une place à bord que vous évitez?
  La salle des machines, trop chaudes, trop bruyantes
- Vous avez eu une discussion intéressante avec ...
  Benoît à propos des Canadiens de Montréal et sur le fait de se sentir à la maison lorsqu'on est à des milliers de kilomètres de chez-soi
- Quel élément naturel vous a le plus impressionné?
  Le lever de soleil sur la glace de mer dans le détroit de Vilkitskiï en étant escorté par un brise-glace nucléair
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  McDonalds
- Est-ce que vous vous ennuyez de quelque chose?
  Ma copine Lisa
- Complétez la phrase: à 3:30 du matin …
  quelqu'un frappe à la porte pour annoncer une station
- Le mot du jour?
  On ne peut rien y faire
- Vision?
  L'ours polaire avec son petit, nageant pour survivre

12. September 2013: Yaroslav Ovsepyan

Tagesbericht	Daily report	Résumé de la journée
Wir befinden uns in der östlichen Laptewsee und bewegen uns in Richtung der Belkowski-Insel. Wir warten auf besseres Wetter. Auf dem Deck ist das Arbeiten nicht möglich, dafür kümmern wir uns gerade um Berichte. Es ist kalt (0°C) und stürmisch (Wind: 4 m/s, Luftdruck: 758 mm).	We are now in the eastern part of the Laptev Sea, sailing to the Belkovskiy Island. We are waiting for good weather. No work on deck, but we are starting with our reports. It's cold (0°C) and stormy (wind: 4 m/s, atmospheric pressure: 758 mm.	Nous sommes dans la partie est de la mer de Laptev, naviguant vers l'île de Belkovskiï. Nous attendons une météo plus clémente. Pas de travail sur le pont, mais on peu commencer les rapports. Il fait froid, le temps est à la tempête.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Gut
- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Ja, ich kriege neue, einmalige Daten aus der westlichen Laptewsee
- Welches Essen hat Dir bisher am besten gefallen?

Fischsuppe

- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Kaviar
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Alles ist super, bis auf das Rollen des Schiffes und die Seekrankheit
- Welche Bereiche an Bord meidest Du unbedingt?
  Keine
- Eine interessante Unterhaltung hattest Du mit ...
  dem Mechaniker über den Schiffsmotor
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Die Ruhe und das Eis in der Wilkizkistraße
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Etwas mit Schokolade
- Was vermisst Du von zu Hause am meisten?
  Ich vermisse meinen Sohn. Er hätte mir mit den Sedimentproben helfen können
- Vervollständige den Satz: Nachts um halb drei ...
  schlief ich in Harmonie mit den Wellen
- Wie lautet Dein Spruch des Tages?
  Im Schlechten liegt das Gute im Ansatz schon verborgen
- Vision?
  Ich wünsche mir so viele Proben wie nur möglich!

>> Mood barometer <<

- What is the general mood on board?
  Good
- Are you content with the samples/data you have obtained?
  Yes, I get unique data from the western Laptev Sea
- What kind of food is your favorite on board?
  Fish soup
- Your opinion: What will be used up first?
  Caviar
- What is your most amazing/worst discovery on board?
  Everything is amazing except for rolling and sea-sickness
- Is there any place on the ship you prefer not to visit?
  No
- You had an interesting talk with ...
  the mechanic about the ship's enginge
- What was the most exciting weather/nature phenomenon so far?
  The calm and the sea ice in the Vilkitsky Strait

- What will be the first drink/food you order after the cruise?
  Something with chocolate
- Do you badly miss anything from at home?
  I miss my son, he could help me with sediment sampling
- Complete the sentence: at 3.30 a.m. ...
  I slept rocking with the waves
- Today's motto
  Every cloud has a silver lining
- Vision?
  I hope for more samples

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Bon
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Oui, j'ai des échantillons uniques de la partie Ouest de la mer de Laptev
- Quel a été votre repas favoris?
  La soupe de poisson
- Quelle denrée manquera en premier?
  Caviar
- Quelle est votre meilleure/pire découverte à bord?
  Tout est excellent mis à part le roulement du navire et le mal de mer qui s'en suit
- Est-ce qu'il y à une place à bord que vous évitez?
  Non
- Vous avez eu une discussion intéressante avec ...
  mécanicien, à propos du moteur
- Quel élément naturel vous a le plus impressionné?
  Le calme et la glace de mer dans le détroit de Vilkitskiï
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Quelque chose avec du chocolat
- Est-ce que vous vous ennuyez de quelque chose?
  Mon fils, il pourrait m'aider avec l'échantillonnage de sédiment
- Complétez la phrase: à 3:30 du matin …
  je dors, bercé par les vagues
- Le mot du jour?
  Tout les nuages ont un "silver lining"
- Vision?
  J'espère avoir plus d'échantillons

13. September 2013: Dieter Piepenburg

Tagesbericht	Daily report	Résumé de la journée
Wir haben nach einer mitternächtlichen Station die recht stürmische Nacht über im Schutz der Belkowski-Insel in der östlichen Laptewsee geankert, um besseres Wetter abzuwarten. Jetzt sind wir bei abflauenden Winden und deutlich ruhigerer See (aber leider wolkenverhangenem Himmel) mit 10 Knoten unterwegs auf nordwestlichem Kurs zur Kotelnyi-Station, die wir nach ca. 170 Seemeilen Fahrt gegen 22 Uhr (Moskauzeit) erreichen werden. Dort erwartet uns wieder eine "lange" Station, auf der eine weitere Verankerung ausgebracht werden und alle Geräte eingesetzt sollen. Obwohl heute "Freitag, der Dreizehnte" ist, hoffen wir alle auf eine erfolgreiche Probennahme.	After having carried out a station around midnight, we anchored near Belkovsky Island in the eastern Laptev Sea until the morning and waited for better weather. Now we are underway, with a waning wind and a calmer sea (but overcast sky), with 10 knots on a northwestern course to Kotelnyy station. We expect to arrive there after a 17-nm trip at 10 p.m. After arrival we will carry out another "long station", using all our equipment and deploying another seafloor observatory. Although today is "Friday the thirteenth", we hope for successful sampling at the end of the day.	Après une station vers minuit, nous avons posé l'ancre à proximité de l'île de Belkovskiï situé dans la partie Est de la mer de Laptev. Nous y avons attendu un temps plus clément jusqu'au petit matin pour ensuite nous diriger vers la station Kotelnyï, porté par une mer plus calme et des vents favorables. Nous devrions terminer ce périple de 17 miles nautiques vers 22h ce soir. Cette station en sera une majeure où tous les instruments seront déployés, incluant un important mouillage. Malgré le fait que nous sommes un vendredi 13, nous espérons une station remplié de succès pour tous.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?

  Immer noch gut – trotz langsam, aber spürbar abnehmender Vielfalt im Nahrungsanbot und zunehmender "Zeitnot" zum Ende der Expedition ...

- Bist Du zufrieden mit der Proben-/Datenausbeute?

  Leider nicht, wir bräuchten für unsere Untersuchungen zum benthischen Sauer- und Nährstoffumsatz (die etwa 48 Stunden laufen müssen) noch Multicorer-Sedimentkerne von zwei weiteren Stationen – und die Zeit wird langsam knapp ... (siehe oben). Noch gilt aber: "Die Lage ist ernst, aber nicht hoffnungslos"

- Welches Essen hat Dir bisher am besten gefallen?

  Borschtsch mit Smetana

- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?

  Das gute Graubrot ... oder doch eher Nutella?

- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?

Am "unerwartetsten": das gute Essen an Bord; am "unerfreulichsten": die plötzlich auftretenden, heftigen Schwankungen der Temperatur des Duschwassers

- Welche Bereiche an Bord meidest Du unbedingt?

  Die Jenskaja Duschebaja, zum Beispiel ...

- Eine interessante Unterhaltung hattest Du mit ...

  Igor, dem Chef-Mechaniker an Bord (... vornehmlich "mit Händen und Füßen", da Igor kaum Deutsch oder Englisch und ich kaum Russisch kann ... da waren ein, zwei Gläschen Wodka ganz hilfreich)

- Was war bisher das aufregendste Wetter/Naturphänomen?

  Die schwimmende Eisbärin mit ihrem Jungen auf dem Rücken

- Welches Getränk/Essen bestellt Du Dir zuerst an Land?

  Ich bin mir nicht sicher, was es in Tiksi zu kaufen geben könnte, das wir an Bord nicht eh (noch) haben... einen Cappuccino vielleicht?

- Was vermisst Du von zu Hause am meisten?

  Ganz trivial, aber so ist's: Frau und Kinder

- Vervollständige den Satz: Nachts um halb drei ...

  ist's taghell seit Stunden – und natürlich wird gearbeitet, und zwar mit Pfiff! (Irgendwie muss sich das ja reimen, wenn's schon mit dem Versmaß nicht hinhaut!)

- Wie lautet Dein Spruch des Tages?

  "Schau'n mer mal ..."

- Vision?

  Auf den letzten Drücker noch zwei weitere erfolgreiche Probennahmen auf den Mooring-Stationen – und alles wird gut ...

>> Mood barometer <<

- What is the general mood on board?

  Still good – although at the end of the cruise the diversity of the meals is clearly decreasing and time is running out ...

- Are you content with the samples/data you have obtained?

  Unfortunately not really ... We still need multicorer samples from two further stations for our investigations on the benthic oxygen and nutrient turnover (they last approximately two full days) – and time is running out (see above). But we are still optimistic, true to the proverb: "The situation is serious but not hopeless"

- What kind of food is your favorite on board?

  Borshtsh with smetana

- Your opinion: What will be used up first?

  Brown bread – or rather Nutella?

- What is your most amazing/worst discovery on board?

  The most "unexpected": the good food; the most unpleasant: the sudden and strong fluctuations of the temperature of the shower water

- Is there any place on the ship you prefer not to visit?

  The Jenskaya Dushebaya, for example ...

- You had an interesting talk with ...

  Igor, the ship's chief "mechanik" (... we mainly used our hands and feet, since Igor's German and English is rather limited, and my Russian is even worse ... that's why the few glasses of wodka we took were quite helpful)
- What was the most exciting weather/nature phenomenon so far?

  The swimming female polar bear, with her cub on her back
- What will be the first drink/food you order after the cruise?

  I'm not sure whether we can buy anything in Tiksi that we don't have on bord (yet) ... maybe a cappuccino?
- Do you badly miss anything from at home?

  That's simple (and not very inventive): my wife and children
- Complete the sentence: at 3.30 a.m. ...

  the sun has already risen hours ago – and everyone is busy working, of course
- Today's motto

  "Let's see ..."
- Vision?

  We will carry out two further successful sampling stations – and eventually everything's alright!

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?

  Plutôt bon, malgré le fait que la diversité des repas va en décroissance, de plus, le temps commence à manquer
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?

  Malheureusement pas encore. Nous avons besoin encore de deux stations de carottages pour nos incubations visant à étudier les flux sédimentaire d'oxyène et de nutriments. Chaque incubation doit durer environ 48h, le temps presse donc. Comme le dit le proverbe, la situation est grave mais pas désespérée
- Quel a été votre repas favoris?

  Borshtsh avec smetana
- Quelle denrée manquera en premier?

  Le pain brun ... ou le nutella?
- Quelle est votre meilleure/pire découverte à bord?

  Le plus surprenant: la bonne qualité de la nourriture. Le pire: les variations soudaines de la température de la douche
- Est-ce qu'il y à une place à bord que vous évitez?

  Le Jenskaya Dushebaya par exemple
- Vous avez eu une discussion intéressante avec ...

  Igor le chef mécano, la conversation fut limité par son anglais (et mon russe qui est bien pire que son anglais). Nous avons donc parlé par geste ... la vodka aida un peu le tout
- Quel élément naturel vous a le plus impressionné?

L'ours polaire nageant avec son petit sur son dos

- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Je ne suis pas certain de ce qu'on peu acheter a Tiksi, mais j'aimerais bien un cappucino
- Est-ce que vous vous ennuyez de quelque chose?
  C'est plutôt simple, et peu inventif: femme et enfants
- Complétez la phrase: à 3:30 du matin …
  le soleil est levé depuis quelques heures et tout le monde s'affaire sur la station
- Le mot du jour?
  "Nous verrons"
- Vision?
  Nous allons obtenir deux autres excellentes stations et tout ira pour le mieux!

14. September 2013: Benoît Thibodeau

Tagesbericht	Daily report	Résumé de la journée
Wann fängt eine Reise an, wann hört sie auf? Ist nicht das Ende immer ein neuer Anfang? Die 21. TRANSDRIFT-Expedition ist nun in ihrer Endphase; in weniger als 24 Stunden werden wir unsere letzte Wasserbeprobung durchführen und in Tiksi einlaufen, unseren letzten Hafen. Für uns alle bedeutet das das Ende unseres Aufenthaltes auf der VIKTOR BUYNITSKIY und der Mitternachts-Beprobung, es bedeutet aber auch, dass wir anfangen, über die gesammelten Daten, über die bevorstehende Laborarbeit und schließlich über die kommende RExpedition TRANSDRIFT XXII nachzudenken.	When does a journey begin, when does a journey end, really? Isn't the end always a new beginning? The 21st TRANSDRIFT expedition is now in its last day; in less than 24 hours we will have our last water sampling and we will then head to Tiksi, our final port. For all of us, this means the end of our stay on the VIKTOR BUYNITSKIY and of middle-of-the-night sampling but also it means that we are starting to think about the collected data, the upcoming labwork and finally about the planning of TRANSDRIFT XXII.	Est-il vraiment possible d'établir avec certitude le début et la fin d'une expérience comme celle-ci? La fin n'est-elle pas toujours aussi un début en soi? Nous en sommes au dernier jour de l'expédition TRANSDRIFT XXI, dans moins de 24h nous poserons l'ancre à Tiksi, notre port final. Pour nous tous, cela signifie la fin de nôtre séjour sur le VIKTOR BUYNITSKIY ainsi que la fin des échantillonnages au beau milieu de la nuit, mais cela signifie aussi le début de la réflexion sur les données acquises, le travail de laboratoire à venir ainsi que la préparation de TRANSDRIFT XXII.

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?
  Zufrieden. Obwohl wir eine ernstzunehmende Verspätung hatten, fühlen wir uns im

Stande, das bestmögliche aus unserer Zeit hier an Bord herauszuholen. Mit jeder Minute, in der wir uns dem Land nähern, werden die Leute immer aufgeregter

- Bist Du zufrieden mit der Proben-/Datenausbeute?

  Ja, ich habe jede Station beprobt, die wir machen konnten. Darüber hinaus haben wir letzte Nacht die automatische Beprobung für die Sauerstoffisotope installiert, auf diese Proben muss ich aber noch ein Jahr warten

- Welches Essen hat Dir bisher am besten gefallen?

  Die Gummibären

- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?

  Komischerweise war es der warme Joghurt, der all die Tage auf dem Tisch stand ... Ich glaube, er wäre sogar fast von selber davongelaufen ...

- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?

  Jede Expedition ist voll von tollen Entdeckungen, aber die wichtigste wird immer für mich die sein, dass man neue Freundschaften schließt und alte weiterentwickelt, wenn man zusammen an einem Ziel arbeitet. Die schlimmste Entdeckung war, als wir feststellen mussten, dass die Batterien in der CTD in dem kalten Wasser der Laptewsee schnell aufgebraucht waren

- Welche Bereiche an Bord meidest Du unbedingt?

  Das Raucherzimmer aus erdenklichen Gründen

- Eine interessante Unterhaltung hattest Du mit ...

  Heidi. Ich habe es genossen ihr bei den Erzählungen über die zahlreichen alten TRANSDRIFT-Expeditionen zuzuhören

- Was war bisher das aufregendste Wetter/Naturphänomen?

  Als wir Richtung Osten gefahren sind, angeführt von einem starken, jedoch leisen nuklearen Eisbrecher, habe ich den Sonnenaufgang über dem schmelzenden Eis der Wilkizkistraße genossen

- Welches Getränk/Essen bestellt Du Dir zuerst an Land?

  Ein Glas Bordeaux mit einem Stück Rochefort, auf ordentlichem Baguette

- Was vermisst Du von zu Hause am meisten?

  Mir fehlt eines dieser romantischen Dinner mit meiner Frau

- Vervollständige den Satz: Nachts um halb drei ...

  nimmt das Rosetten-Team einen letzten Tee, bevor es nach einem wiederholt erfolgreichem Einsatz schlafen geht

- Wie lautet Dein Spruch des Tages?

  MucMucMucMuc

- Vision?

  Die Bergung eines nicht bioverseuchten automatischen Wasserbeprobers in einem Jahr gefüllt mit 100-ml-Wasserproben ...

>> Mood barometer <<

- What is the general mood on board?

  Content, while we had to face some serious delay in our expedition, we feel we manage to get the most out of our time here and with land approaching every minute people are

starting to get exited

- Are you content with the samples/data you have obtained?

  Yes, I sampled every single station we could do. Moreover, we deployed the remote auto sampler last night, but I'll have to wait one year to recover the samples

- What kind of food is your favorite on board?

  The Gummy Bears

- Your opinion: What will be used up first?

  Weirdly, it was the warm yoghurts sitting all day long on the table … I think they might have just run away by themselves …

- What is your most amazing/worst discovery on board?

  Every expedition is filled with awesome discoveries, but the one that will always be the most important for me is the friendships that you create and develop with your old and new colleagues when working all together toward a common goal. The worst one was when we discovered how fast the batteries in the CTD were used up in those cold Laptev Sea waters

- Is there any place on the ship you prefer not to visit?

  The smoking room for obvious reasons

- You had an interesting talk with ...

  I've enjoyed listening to Heidi's multiple stories about the past TRANSDRIFT expeditions

- What was the most exciting weather/nature phenomenon so far?

  While sailing eastward, escorted by a powerful, yet silent, nuclear icebreaker, I contemplated the restful sun rising above the melting sea ice of the Vilkitsky Strait

- What will be the first drink/food you order after the cruise?

  A glass of Bordeaux wine with a piece of Rochefort cheese on proper baguette

- Do you badly miss anything from at home?

  I miss having one of those nice romantic dinners with my wife

- Complete the sentence: at 3.30 a.m. ...

  the rosette team is having a last tea together before going to bed after another well-done job

- Today's motto

  Mucmucmucmuc

- Vision?

  Recovering a non-biofouled remote auto sampler in one year with every cell filled with 100 ml of water …

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?

  Content, bien que nous avons dû faire face à d'important délais, nous avons su tire le maximum du temps qui nous était impartie. Avec la terre ferme qui approche, l'équipage commence aussi à être excité

- Etes vous heureux de votre échantillonnage jusqu' à maintenant?

  Oui, j'ai échantilonné toutes les stations possible. De plus, nous avons déployé hier l'auto échantillonneur d'eau qui était ma responsabilité. Mais je dois attendre 1 an pour en voir

les résultats

- Quel a été votre repas favoris?

  Les nounours jujubes

- Quelle denrée manquera en premier?

  Bizarrement, ce sont les yogourts chauds qui restaient toute la journée sur la table, je crois qu'il se sont sauvés par eux même…

- Quelle est votre meilleure/pire découverte à bord?

  Chaque expédition est remplie de merveilleuses découvertes, mais celle qui m'est la plus chère est les nouvelles amitiés qui sont créées en travaillant ensemble vers un même but. La pire découverte fût de découvrir la courte durée de vie des batteries du CTD dans les eaux glaciales de la mer de Laptev

- Est-ce qu'il y à une place à bord que vous évitez?

  Le fumoir, pour des raisons évidentes

- Vous avez eu une discussion intéressante avec ...

  J'ai été ravi d'écouter les histoires d'Heidi à propos des expéditions passées du projet TRANSDRIFT

- Quel élément naturel vous a le plus impressionné?

  Naviguant plein Est, escorté par un puissant, mais silencieux, brise-glace nucléaire, j'ai contemplé un gracieux soleil levant au dessus de la glace de mer fondante dans le Détroit de Vilkitskiï

- Quelle sera le premier aliment que vous allez demander une fois à terre?

  Une verre de Bordeaux et un morceau de Rochefort sur une bonne baguette

- Est-ce que vous vous ennuyez de quelque chose?

  Je m'ennui d'un de ces romantique repas en tête à tête avec ma femme

- Complétez la phrase: à 3:30 du matin …

  l'équipe responsable de la rosette prend un dernier thé ensemble avant d'aller au lit après un travail bien fait

- Le mot du jour?

  Mucmucmucmuc

- Vision?

  Retrouver un échantillonneur automatique remplié et en bonne condition l'an prochain

<u>15. September 2013</u>

TRANSDRIFT XXI – Spannende Forschungsarbeiten in der nordöstlichen und zentralen Laptewsee

Nachdem wir den Sturm ohne Schäden nördlich der Insel Belkowski abgewettert haben, überschlagen sich nun die Ereignisse an Bord der VIKTOR BUYNITSKIY.

Zunächst haben wir das Profil von den Neusibirischen Inseln in Richtung Norden erfolgreich abgeschlossen und bei 77°30'N und 130°58'E das Meeresobservatorium KOTELNYY verankert. Nur 22 Stunden später, im Anschluss an ein E-W verlaufendes CTD-Profil über den Kontinentalhang der Laptewsee, haben wir bei 75°59'N und 125°59'E das Meeresobserva-

torium 1893 verankert. Ohne durchzuatmen, ging es weiter in Richtung nšrdliches Lena-Delta. Auf dem Programm stand das Bergen der Meeresobservatorien KHATANGA und ANABAR, die seit zwei bzw. drei Jahren verschiedene ozeanographische Daten aufzeichnen. Gleich im ersten Anlauf haben wir heute Nacht das Meeresobservatorien KHATANGA geborgen. Verschiedene Sensoren haben im Abstand von wenigen Minuten die Temperatur- und Leitfähigkeit, die Trübe, die Strömungen und die Eisbedeckung registriert. Das Bergen der Verankerung hat insgesamt eine Stunde gedauert – das Herunterladen des umfangreichen Datensatzes, der für die Forschungsarbeiten im Otto-Schmidt-Labor in Sankt Petersburg in den nächsten Jahren eine zentrale Rolle spielen wird, hat fast sechzehn Stunden gedauert.

Die Suche nach ANABAR mussten wir leider am frühen Morgen aufgeben.

Wir befinden uns auf dem N-S-Profil östlich des Lena-Deltas, wo wir morgen unsere Forschungsarbeiten abschließen werden.

Herzliche Grüße aus der Laptewsee

Die Expeditionsteilnehmer

Bennet Juhls programmiert die Rosette

Elena Dobrotina und Ekaterina Abramova beim Wasserproben-Nehmen

Arbeiten an Deck

Felix Müller bei der Inkubation

16. September 2013: Heidi Kassens – Abschließender Bericht der Expeditionsleitung

Eine tolle Expedition neigt sich dem Ende. Wir befinden uns seit heute auf einem von Norden nach Süden verlaufenden Profil östlich des Lena-Deltas und wir werden Tiksi pünktlich am 17.9.13 erreichen.

Fazit TRANSDRIFT XXI:

- 27 Tage (bis heute) an Bord VIKTOR BUYNITSKIY,

- bisher 3.468 sm von Archangelsk bis zum Lena-Delta zurückgelegt,

- 20 Stationen entlang von vier N-S verlaufenden und vier E-W verlaufenden Profilen,

- über 200 CTD-Profile,

- alle vier Meeresobservatorien erfolgreich verankert,

- ein Meeresobservatorium nördlich des Lena-Deltas geborgen.

Wir alle haben die VIKTOR BUYNITSKIY mit ihrer hervorragenden Mannschaft unter der Leitung von Kapitän Alexandr Steshov ins Herz geschlossen und wir hoffen, dass wir 2014 im Rahmen der Expedition TRANSDRIFT XXII wieder an Bord gehen können.

Ein großes Dankeschön an alle, die diese Expedition ermöglicht haben!

A fantastic expedition is drawing to a close. Today we are working on a north/south transect east of the Lena Delta and we will arrive in Tiksi on schedule on September 17.

Summing up TRANSDRIFT XXI:

- 27 days (up to now) on board the VIKTOR BUYNITSKIY,

- so far sailed 3,468 nm from Arkhangelsk to the Lena Delta,

20 stations along four N-S and four E-W transects,

- more than 200 CTD profiles,

- all four seafloor observatories deployed,

- one seafloor observatory recovered north of the Lena Delta.

We all have become fond of the VIKTOR BUYNITSKIY and her excellent crew under Captain Alexandr Steshov and we hope to sail with them during TRANSDRIFT XXI in 2014, too.

A big thank you to all who made this expedition possible!

Une superbe expédition tire a sa fin. Aujourd'hui nous sommes sur un transect nord-sud proche du détroit de Léna et nous allons gagner Tiksi à temps.

Fait divers:

- 27 jours à bord du navire,

- 3468 miles nautiques parcourues,

- 20 stations repartie sur 4 N-S et 4 E-W transect,

- Plus de 200 profiles CTD,

- 4 mouillages deployes,

- 1 mouillage repêché.

Nous avons tous adopté le VIKTOR BUYNITSKIY et son équipage et son capitaine Alexandr Steshov et nous espérons qu'en 2014 nous y seront encore pour la 22e édition de l'expédition TRANSDRIFT. Une gros merci a tous ceux qui ont permis la réalisation de cette expédition!

>> Expeditionsbarometer <<

- Wie ist die Stimmung an Bord?

  Sehr gut und das deutsch-russisch-kanadische Wissenschaftler-Team ist zu einer schlagkräftigen Truppe zusammengewachsen, die keinen Sturm mehr scheut

- Bist Du zufrieden mit der Proben-/Datenausbeute?
  Ich bin mehr als zufrieden mit der Ausbeute – die „Underway-CTD“ hat mich dabei besonders beeindruckt
- Welches Essen hat Dir bisher am besten gefallen?
  Das Essen ist sehr gut und am besten gefallen mir die Suppen und das frische Weißbrot
- Was neigt sich Deiner Meinung nach auf dem Schiff zuerst dem Ende?
  Bestimmt nicht die gute Stimmung
- Was war bisher Deine tollste/schrecklichste Entdeckung an Bord?
  Die hervorragende Mannschaft, die rund um die Uhr für uns arbeitet
- Welche Bereiche an Bord meidest Du unbedingt?
  Den Wellentunnel (im Maschinenraum)
- Eine interessante Unterhaltung hattest Du mit ...
  auf der Brücke über das Arbeiten auf russischen Forschungsschiffen
- Was war bisher das aufregendste Wetter/Naturphänomen?
  Die schwimmende Eisbärin mit ihrem Nachwuchs auf dem Rücken in der nördlichen Laptewsee weit entfernt von Eiskante und Land
- Welches Getränk/Essen bestellt Du Dir zuerst an Land?
  Frische Brötchen
- Was vermisst Du von zu Hause am meisten?
  Lange Spaziergänge mit Buko in Heidkate
- Vervollständige den Satz: Nachts um halb drei ...
  und es riecht nach Kaffee. Das bedeutet, die Forschung läuft
- Wie lautet Dein Spruch des Tages?
  Wie wird das Wetter und hat jemand eine Wasserwaage dabei?
- Vision?
  Bitte kein schlechtes Wetter mehr und hoffentlich sind wir nächstes Jahr wieder an Bord der VIKTOR BUYNITSKIY

>> Mood barometer <<

- What is the general mood on board?
  Very good and the German-Russian-Canadien science team has grown together into an effective group who doesn't dread any storm
- Are you content with the samples/data you have obtained?
  I'm more than content – and I'm deeply impressed by the underway CTD
- What kind of food is your favorite on board?
  The food is very good and I like the soups and the freshly baked white bread in particular
- Your opinion: What will be used up first?
  Certainly not our wonderful mood
- What is your most amazing/worst discovery on board?
  The excellent crew, they work around the clock for us
- Is there any place on the ship you prefer not to visit?

The shaft alley (in the engine room)

- You had an interesting talk ...
  on the bridge about working on Russian research vessels
- What was the most exciting weather/nature phenomenon so far?
  The swimming female polar bear, with her cub on her back in the northern Laptev Sea far from ice edge or land
- What will be the first drink/food you order after the cruise?
  Freshly baked rolls
- Do you badly miss anything from at home?
  Long walks with Buko in Heidkate
- Complete the sentence: at 3.30 a.m. ...
  and it smells of coffee. That means that research is being done
- Today's motto
  What will the weather be like and does anybody happen to have a level with them?
- Vision?
  Please no storms any more and I hope we will be again onboard the VIKTOR BUYNITSKIY next year

>> Baromètre de l'humeur <<

- Quel est l'atmosphère à bord du navire?
  Très bien, l'équipe allemande-russe-canadienne est maintenant un groupe unique qui ne craint aucune tempête
- Etes vous heureux de votre échantillonnage jusqu' à maintenant?
  Je suis plus que contente avec les prélèvements effectués. L'underway CTD m'impressionne particulièrement
- Quel a été votre repas favoris?
  La nouriture est très bonne, spécialement les soupes et le pain frais
- Quelle denrée manquera en premier?
  Certainement pas la bonne ambiance
- Quelle est votre meilleure/pire découverte à bord?
  Le merveilleuse équipage du navire qui travaille à temps plein pour nous
- Est-ce qu'il y à une place à bord que vous évitez?
  Le tunel à vague (dans la salle des machines)
- Vous avez eu une discussion intéressante ...
  sur le pont à propos du travail sur les navires de recherche russes
- Quel élément naturel vous a le plus impressionné?
  L'ourse polaire nageant avec son petit sur son dos, très loin de la glace et de la terre
- Quelle sera le premier aliment que vous allez demander une fois à terre?
  Pain frais
- Est-ce que vous vous ennuyez de quelque chose?
  Longue marché avec Buko sur la plage d'Heidkate

- Complétez la phrase: à 3:30 du matin …
  ça sent la café, ça veux dire que la science s'en vient
- Le mot du jour?
  Quelle sera la temperature et est-ce que quelqu'un a un niveau
- Vision?
  S'il vous plait plus de mauvais temps et nous espérons être à bord du VIKTOR BUYNITSKIY l'an prochain

18. September 2013

Heute Morgen um 4 Uhr lief die VIKTOR BUYNITSKIY bei Schneefall und Temperaturen um den Gefrierpunkt wohlbehalten in Tiksi ein, nachdem die Expeditionsarbeiten offiziell mit dem "letzten Bathometer" gestern um 16:30 Uhr abgeschlossen worden waren. Alle Teilnehmer sind zufrieden mit dem Verlauf der Forschungsarbeiten, und abschließend können wir auf eine sehr erfolgreiche Expedition zurückblicken.

Heute steht das Packen der Kisten auf dem Programm, womit wir bis heute Abend fertig sein werden. So bleibt noch genügend Zeit, um einen Rundgang durch das schon winterliche Tiksi zu machen.

Morgen früh brechen wir dann in Richtung Flugplatz auf. Wir hoffen, dass alles planmäßig laufen wird. Unser Flugzeug soll am Nachmittag starten. Die erste Etappe führt uns bis nach Jakutsk, wo wir eine Nacht verbringen werden, ehe es übermorgen dann nach Moskau, Sankt Petersburg bzw. Hamburg weitergeht.

Wir freuen uns nun auf zu Hause und unsere Lieben dort!

Herzliche Grüße

Die Expeditionsteilnehmer

21. September 2013

Mit 24-stündger Verspätung erreichen die Teilnehmer der Expedition TRANSDRIFT XXI am Abend des 21. September 2013 Moskau, Sankt Petersburg, Achterwehr, Bokel, Dänischer Wohld, Hamburg, Rastede und Kiel.

Wir sagen Tschüss und freuen uns auf TRANSDRIFT XXII im Sommer 2014

Das MUC-Team mit Felix, Dieter, Sergey, Volodya, Vasily, Alexandr, Anatoly, Yaroslav und Heidi

Das Netz-Team mit Fedor, Alexandr und Katya A.

Das Verankerungsteam mit Jens, Markus, Matthias und Tim (leider nicht auf dem Foto)

Das Wasser-Team mit Dima, Elena, Irina, Benoît, Bennet, Georgi und Katya C. (leider nicht auf dem Foto)

Stehend (von links nach rechts): Elena Dobrotina, Heidi Kassens, Dmitry Selitrenikov, Ekaterina Chernyavskaya, Felix Müller, Irina Kryukova, Benoît Thibodeau, Sergei Korsun, Fedor Martynov, Tim Sandmann, Bennet Juhls, Ekaterina Abramova, Markus Janout, Ivan Vorobyev (Lena Delta State Reserve; did not participate), Matthias Monsees

Hockend (von links nach rechts): Georgi Laukert, Alexandr Ipatov, Jens Hölemann, Dieter Piepenburg, Yaroslav Ovsepyan, Konstantin (Fahrer des Lena-Delta-Reservats)

E – Press releases

GEOMAR
Helmholtz-Zentrum für Ozeanforschung Kiel

22.08.2013

Auf der Spur des Klimawandels in der Arktis

Neues deutsch-russisches Forschungsprojekt startet mit ersten Expeditionen ins Nordpolarmeer

22.08.2013/Kiel. Wie wirkt sich der Klimawandel auf die Eisbildung in den arktischen Randmeeren aus? Wie beeinflussen die Veränderungen das Ökosystem? Und wie sehen die großräumigen Folgen für die gesamte Arktis und bis hinein in den Atlantik aus? Mit diesen Fragen beschäftigen sich deutsche und russische Wissenschaftler während einer heute startenden Expedition in die ostsibirische Laptewsee. Es ist die erste Expedition in die russische Arktis im Rahmen eines neuen, am GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel koordinierten deutsch-russischen Verbundprojekts, das von russischer und deutscher Seite für drei Jahre mit rund 7 Millionen Euro gefördert wird.

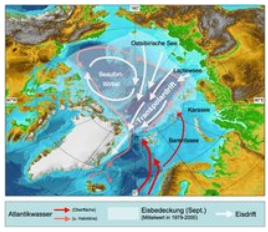
Das Eis für die Ökosysteme in der Arktis wird dünner – wortwörtlich. Denn nicht nur die Fläche, die das Eis im Nordpolarmeer während der Sommermonate einnimmt, wird von Jahr zu Jahr kleiner. Auch die Dicke des Eises nimmt messbar ab. So ist das Eisvolumen in der Arktis in den vergangenen 30 Jahren um etwa 75 Prozent geschrumpft. „Diese Veränderungen zeigen sich besonders deutlich im Gebiet der Transpolardrift, die Meereis von den Küsten Sibiriens über den Nordpol bis in die Framstraße zwischen Spitzbergen und Grönland transportiert“, erklärt Dr. Heidemarie Kassens vom GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel. Deshalb wird ein neues deutsch-russisches Forschungsprojekt mit dem Titel „System Laptewsee - Das transpolare System des Nordpolarmeeres“ sich großräumig mit den Veränderungen in der Arktis und mit den Auswirkungen für Europa beschäftigen. Das Bundesministerium für Bildung und Forschung (BMBF), das russische Ministerium für Bildung und Forschung, das Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (AWI) und das GEOMAR finanzieren das Projekt bis 2016 mit 7 Millionen Euro. Insgesamt sind 15 Expeditionen in das Gebiet der Transpolardrift geplant. Heute (22.08.) startet die erste in die ostsibirische Laptewsee. Zusammen mit 19 weiteren Wissenschaftlern aus Deutschland und Russland wird die Projektkoordinatorin Dr. Kassens dort von dem russischen Forschungsschiff VIKTOR BUYNITSKIY aus Ozeanbeobachtungsstationen ausbringen, die ein Jahr lang die Veränderungen genau beobachten sollen, sowie ozeanographische, meereschemische und biologische Messungen vornehmen werden.

Das Projekt baut auf langjährige gemeinsame deutsch-russische Forschungsarbeiten auf, in denen Wissenschaftler vieler unterschiedlicher Disziplinen zusammenarbeiteten. Ziel ist es, das gesamte Ausmaß des Wandels in der Arktis zu erfassen. Denn die Erwärmung der Arktis führt nicht nur zum Verlust des Eises, sondern hat auch Folgen für die Chemie und Physik des arktischen Meerwassers, für die Atmosphäre und für den polaren Lebensraum.

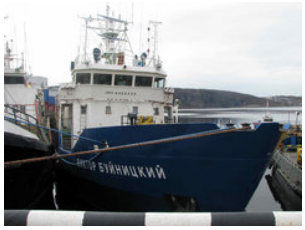
„Die oberflächennahen Wassermassen sind wärmer und weniger salzhaltig als noch vor wenigen Jahren. Immer mehr Arten aus dem Atlantik wandern in das Nordpolarmeer ein, gleichzeitig nimmt die Ozeanversauerung zu. All das hat Folgen für diesen sensiblen Lebensraum, die wir noch nicht absehen können“, erklärt Dr. Kassens, die schon in den vergangen Jahren regelmäßig Expeditionen in die Laptewsee geleitet hat.

Während der jetzt anstehenden Fahrt mit dem offiziellen Titel TRANSDRIFT XXI sollen insgesamt fünf Messstationen in der Laptewsee verankert werden. Sie sind unter anderem mit neuartigen, automatischen Wasserprobensammlern ausgestattet. „Ein Jahr lang werden sie wöchentlich je eine Wasserprobe nehmen. Dadurch können wir die physikalischen Veränderungen der Wassermassen über alle Jahreszeiten hinweg verfolgen“, erklärt Dr. Jens Hölemann vom AWI.

Während die Expedition TRANSDRIFT XXI zum Ursprung der Transpolardrift vor der Küste Ostsibiriens führt, arbeiten gleichzeitig weitere Wissenschaftler in



Die Transpolardrift verbindet die arktischen Schelfmeere mit der Framstraße zwischen Spitzbergen und Grönland. Deutsche und russische Forscher wollen gemeinsam die Auswirkungen des Klimawandels auf dieses System untersuchen. Grafik: GEOMAR


Das russische Forschungsschiff VIKTOR BUYNITSKKIY. Gut einen Monat lang legen deutsche und russische Forscher mit ihm Beobachtungsstationen in der ostsibirischen Laptevsee aus. Foto: H. Kassens, GEOMAR


Das deutsche Forschungsschiff MARIA. S. MERIAN ist aktuell vor Spitzbergen im Einsatz. Auch die Expedition MSM31 trägt zum Projekt "Transpolardrift" bei. Foto: JAGO-Team, GEOMAR.

deren Endregion vor Spitzbergen. Auf der vom AWI geleiteten Expedition MSM31 mit dem deutschen Forschungsschiff MARIA S. MERIAN ist unter anderen Dr. Robert Spielhagen (GEOMAR/Akademie der Wissenschaften und der Literatur Mainz) eingeschifft, um nördlich von Spitzbergen hochauflösende Sedimentkerne aus dem Meeresboden zu bergen. „Damit können wir die Entwicklung der Eisbedeckung und der Umweltbedingungen am Ende der Transpolardrift über mehrere tausend Jahre zurückverfolgen“, erklärt der Paläoozeanograph.

„Auf diese Weise schlagen wir den wissenschaftlichen Bogen von der Laptewsee als wichtiges Entstehungsgebiet für Meereis einerseits bis zur Framstraße als einzige Tiefenwasserverbindung zwischen dem Nordpolarmeer und dem Atlantik andererseits“, erklärt die Projektkoordinatorin Dr. Kassens. „Die Arktis scheint weit weg zu sein, doch über die Atmosphäre und die Meeresströmungen beeinflussen Veränderungen dort auch das Klima und die Umweltbedingungen bei uns in Europa. Umso wichtiger ist es, diese Veränderungen und ihre Konsequenzen zu verstehen.“

Projektpartner:

- GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel (Koordination Deutschland)
- Staatliches Institut für Arktis- und Antarktisforschung (AARI), Sankt Petersburg, Russland (Koordination Russland)
- Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung
- Akademie der Wissenschaften und der Literatur Mainz
- Universität Trier
- Christian-Albrechts-Universität zu Kiel
- Universität Moskau
- P. P. Shirshov-Institut für Ozeanographie Moskau
- Lena-Delta Reservat Tiksi
- Staatliches N. N. Zubov-Institut für Ozeanographie (GOIN)

Bildmaterial in höherer Auflösung:

Die Transpolardrift verbindet die arktischen Schelfmeere mit der Framstraße zwischen Spitzbergen und Grönland. Deutsche und russische Forscher wollen gemeinsam die Auswirkungen des Klimawandels auf dieses System untersuchen. Grafik: GEOMAR
Das russische Forschungsschiff VIKTOR BUYNITSKKIY. Gut einen Monat lang legen deutsche und russische Forscher mit ihm Beobachtungsstationen in der ostsibirischen Laptevsee aus. Foto: H. Kassens, GEOMAR
Das deutsche Forschungsschiff MARIA. S. MERIAN ist aktuell vor Spitzbergen im Einsatz. Auch die Expedition MSM31 trägt zum Projekt "Transpolardrift" bei. Foto: JAGO-Team, GEOMAR.

Ansprechpartner:

Dr. Heidemarie Kassens (GEOMAR, FB1-Paläoozeanographie), hkassens(at)geomar.de
Jan Steffen (GEOMAR, Kommunikation & Medien), Tel.: 0431 600-2811, jsteffen(at)geomar.de

In Verbindung stehende Artikel:

Kein ewiges Eis mehr in der Arktis

Dateien:

pm_2013_43_TransdriftXXI.pdf 44 K

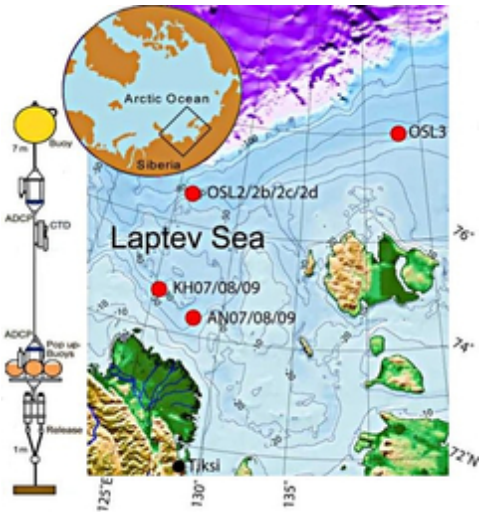
Links:

www.geomar.de GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel
www.aari.nw.ru Staatliches Institut für Arktis- und Antarktisforschung (AARI), Russland
www.awi.de Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung

<- Zurück zu: Aktuelle Meldungen

22. August 2013: **Auf der Spur des Klimawandels in der Arktis - Neues deutsch-russisches Forschungsprojekt startet mit ersten Expeditionen ins Nordpolarmeer**

***Bremerhaven/Kiel, 22. August 2013*. Wie wirkt sich der Klimawandel auf die Eisbildung in den arktischen Randmeeren aus? Wie beeinflussen die Veränderungen das Ökosystem? Und wie sehen die großräumigen Folgen für die gesamte Arktis und bis hinein in den Atlantik aus? Mit diesen Fragen beschäftigen sich deutsche und russische Wissenschaftler während einer heute startenden Expedition in die ostsibirische Laptewsee. Es ist die erste Expedition in die russische Arktis im Rahmen eines neuen, am GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel koordinierten deutsch-russischen Verbundprojekts, das von russischer und deutscher Seite für drei Jahre mit rund 7 Millionen Euro gefördert wird.**



Das Eis für die Ökosysteme in der Arktis wird dünner – wortwörtlich. Denn nicht nur die Fläche, die das Eis im Nordpolarmeer während der Sommermonate einnimmt, wird von Jahr zu Jahr kleiner. Auch die Dicke des Eises nimmt messbar ab. So ist das Eisvolumen in der Arktis in den vergangenen 30 Jahren um etwa 75 Prozent geschrumpft. „Diese Veränderungen zeigen sich besonders deutlich im Gebiet der Transpolardrift, die Meereis von den Küsten Sibiriens über den Nordpol bis in die Framstraße zwischen Spitzbergen und Grönland transportiert“, erklärt Dr. Heidemarie Kassens vom GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel. Deshalb wird ein neues deutsch-russisches Forschungsprojekt mit dem Titel „System Laptewsee - Das transpolare System des Nordpolarmeeres“ sich großräumig mit den Veränderungen in der Arktis und mit den Auswirkungen für Europa beschäftigen. Das Bundesministerium für Bildung und Forschung (BMBF), das russische Ministerium für Bildung und Forschung, das Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung (AWI) und das GEOMAR finanzieren das Projekt bis 2016 mit 7 Millionen Euro. Insgesamt sind 15 Expeditionen in das Gebiet der Transpolardrift geplant. Heute (22.08.) startet die erste in die ostsibirische Laptewsee. Zusammen mit 19 weiteren Wissenschaftlern aus Deutschland und Russland wird die Projektkoordinatorin Dr. Kassens dort von dem russischen Forschungsschiff VIKTOR BUYNITSKIY aus Ozeanbeobachtungsstationen ausbringen, die ein Jahr lang die Veränderungen genau beobachten sollen, sowie ozeanographische, meereschemische und biologische Messungen vornehmen werden.

Das Projekt baut auf langjährige gemeinsame deutsch-russische Forschungsarbeiten auf, in denen Wissenschaftler vieler unterschiedlicher Disziplinen zusammenarbeiteten. Ziel ist es, das gesamte Ausmaß des Wandels in der Arktis zu erfassen. Denn die Erwärmung der Arktis führt nicht nur zum Verlust des Eises, sondern hat auch Folgen für die Chemie und Physik des arktischen Meerwassers, für die Atmosphäre und für den polaren Lebensraum.

„Die oberflächennahen Wassermassen sind wärmer und weniger salzhaltig als noch vor wenigen Jahren. Immer mehr Arten aus dem Atlantik wandern in das Nordpolarmeer ein, gleichzeitig nimmt die Ozeanversauerung zu. All das hat Folgen für diesen sensiblen Lebensraum, die wir noch nicht absehen können“, erklärt Dr. Kassens, die schon in den vergangen Jahren regelmäßig Expeditionen in die Laptewsee geleitet hat.

Während der jetzt anstehenden Fahrt mit dem offiziellen Titel TRANSDRIFT XXI sollen insgesamt fünf Messstationen in der Laptewsee verankert werden. Sie sind unter anderem mit neuartigen, automatischen Wasserprobensammlern ausgestattet. „Ein Jahr lang werden sie wöchentlich je eine Wasserprobe nehmen. Dadurch können wir die physikalischen Veränderungen der Wassermassen über alle Jahreszeiten hinweg verfolgen“, erklärt Dr. Jens Hölemann vom AWI.

Während die Expedition TRANSDRIFT XXI zum Ursprung der Transpolardrift vor der Küste Ostsibiriens führt, arbeiten gleichzeitig weitere Wissenschaftler in deren Endregion vor Spitzbergen. Auf der vom AWI geleiteten Expedition MSM31 mit dem deutschen Forschungsschiff MARIA S. MERIAN ist unter anderen Dr. Robert Spielhagen (GEOMAR/Akademie der Wissenschaften und der Literatur Mainz) eingeschifft, um nördlich von Spitzbergen hochauflösende Sedimentkerne aus dem

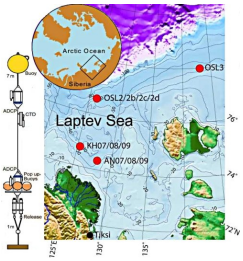
Meeresboden zu bergen. „Damit können wir die Entwicklung der Eisbedeckung und der Umweltbedingungen am Ende der Transpolardrift über mehrere tausend Jahre zurückverfolgen“, erklärt der Paläoozeanograph.

„Auf diese Weise schlagen wir den wissenschaftlichen Bogen von der Laptewsee als wichtiges Entstehungsgebiet für Meereis einerseits bis zur Framstraße als einzige Tiefenwasserverbindung zwischen dem Nordpolarmeer und dem Atlantik andererseits“, erklärt die Projektkoordinatorin Dr. Kassens. „Die Arktis scheint weit weg zu sein, doch über die Atmosphäre und die Meeresströmungen beeinflussen Veränderungen dort auch das Klima und die Umweltbedingungen bei uns in Europa. Umso wichtiger ist es, diese Veränderungen und ihre Konsequenzen zu verstehen.“

Projektpartner:
- GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel (Koordination Deutschland)
- Staatliches Institut für Arktis- und Antarktisforschung (AARI), Sankt Petersburg, Russland (Koordination Russland)
- Alfred-Wegener-Institut Helmholtz-Zentrum für Polar- und Meeresforschung
- Akademie der Wissenschaften und der Literatur Mainz
- Universität Trier
- Christian-Albrechts-Universität zu Kiel
- Universität Moskau
- P. P. Shirshov-Institut für Ozeanographie Moskau
- Lena-Delta Reservat Tiksi
- Staatliches N. N. Zubov-Institut für Ozeanographie (GOIN)

Hinweise für Redaktionen:
Weitere Fotos gibt es auf dieser Webseite des GEOMAR.
Ihr Ansprechpartner am Alfred-Wegener-Institut ist Dr. Jens Hölemann (Tel.: 0471 4831-1983; E-Mail: Jens.Hoelemann(at)awi.de. Ihre Ansprechpartnerin in der Presestelle ist Dr. Folke Mehrtens (Tel.: 0471 4831-2007; E-Mail: Folke.Mehrtens(at)awi.de)

Druckbare Bilder



Ozeanographie in der Laptewsee
Lage der Laptewsee und schematische Darstellung ozeanographischer Messungen. Graphik: Alfred-Wegener-Institut
web print

zurück zur Liste